

Where the River Meets the Sound



An Educator's Guide to Nisqually National Wildlife Refuge



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Where the River Meets the Sound is one in a series of educator's guides prepared for the Nisqually River watershed. This guide was a joint project of the Nisqually National Wildlife Refuge, Nisqually Reach Nature Center and the Nisqually River Education Project. Additional funding was provided by the Friends of Nisqually National Wildlife Refuge, Tacoma Power, and Washington State Department of Ecology's Centennial Clean Water Fund.

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- *An Aquatic Plant Identification Manual for Washington's Freshwater Plants*. Washington State DOE.

Sources

Thanks to all the helpful guides which were produced before this one and on which many of the activities in this guide are based. Particularly:

- *Salt Marsh Manual, An Educator's Guide*. San Francisco Bay National Wildlife Refuge
- *Ridgefield National Wildlife Refuge Educator's Guide*.
- *Project WET, Water Education for Teachers*. Montana State University.
- *The Sibley Guide to Birds*. 2000, David Allen Sibley. NAS, Alfred A. Knopf, New York.

For More Information

The US Fish & Wildlife Service manages national fish hatcheries and wildlife refuges throughout the country for the continued conservation, protection and enhancement of our fish and wildlife resources and their habitats.

The Nisqually River Education Project provides a variety of educational materials and trainings for selected sites throughout the Nisqually River watershed. These resources help students develop an understanding of, and appreciation for, this beautiful watershed – and motivate them to wisely manage its environmental, economic and cultural resources.

For information on this and other educator's guides, teacher workshops and other resources and opportunities, contact:

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Where the River Meets the Sound



Contents

Introduction

Welcome Educator!	1
US Fish & Wildlife Service	2
Nisqually National Wildlife Refuge	4
History of the Refuge	5
Resource Management	6
Map of the Refuge	7
Seasons at the Refuge	8
Hiking Trails and Seasonal Closures	10
Habitats of the Refuge	11
Birds of the Refuge	17
Mammals & Amphibians of the Refuge	23
Plants of the Refuge	25

Field Trip Preparation

Environmental Education Goals & Objectives	29
Key Ecological Concepts	30
Refuge Resources & Facilities	31
Making Reservations	32
Guidelines for Refuge Field Trips	33
Checklist for a Successful Field Trip	34
Group Management Tips	35
Medical Considerations	36
Field Trip Map	37
Reservation Application	38

Pre-Field Trip Activities

Preparing Students for the Field Trip	41
Sensing Nature	44
Habitats & Food Chains	47
Trace Your Trash	52
How to Pack a No-Trash Lunch	54

Education Center

Education Center Activities	57
<i>Cycles of Nature</i>	
Food Chain	58
Why the Tides Ebb and Flow	60
<i>Habitat and Wildlife</i>	
Invertebrate Pictionary	65
What Am I Hungry For?	67
<i>Birds and Migration</i>	
Bird Mapping	72
What Can I Eat With This Beak?	74
<i>Endangered Species</i>	
The Web of Life	76
<i>Earth Stewardship</i>	
All Things Seaward	78
<i>Cultural History of the Nisqually Watershed</i>	
From Marsh to Metropolis	80
Plants and People	82

Outdoor Activities

Habitat Comparison Walk	83
Mini-Expedition	101
Wild Words: A Journal Activity	105
Scavenger Hike: Can You Find It?	108

Post-Field Trip Activities

Sharing Circle/Fill in the Blank	113
Holding a Town Meeting	114
Watershed Watchers	119
Wetland Metaphors	124
More Field Trip Follow Up Ideas	126
Evaluation of the Educator's Guide	127
Evaluation of Refuge's Environmental Education Program	128

Additional Resources

Nisqually Reach Nature Center	129
Glossary	149
Resources	152
Essential Academic Learning Requirements Chart	154

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Introduction

Welcome Educator!

US Fish & Wildlife Service

Nisqually National Wildlife Refuge

History of the Refuge

Resource Management

Map of the Refuge

Seasons at the Refuge

Hiking Trails and Seasonal Closures

Habitats of the Refuge

Birds of the Refuge

Mammals & Amphibians of the Refuge

Plants of the Refuge

"If facts are seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the fertile soil in which the seeds must grow."

— *Rachel Carson*

Where the River Meets the Sound



Introduction

Welcome Educator!

Thank you for choosing to bring your students to Nisqually National Wildlife Refuge! We are happy that you are using the Refuge's resources to enhance the learning experience for your students. With the help of this guide, we hope that field trips to the Refuge delight the senses and nurture an ongoing process of discovery. The guide includes information about the Refuge's habitats and wildlife, as well as the environmental education program: field trip planning, pre-field trip and post-field trip activities, and hands-on field trip activities. Together as educators, we have a chance of increasing environmental awareness throughout our communities.

An Approach to Learning

We seek comprehensive, integrated, hands-on educational methods. Our field trip activities are designed to mesh well with teacher's objectives, and meet state requirements for environmental education. We believe that our role as educators is to awaken in students the following:

- Awe and delight in nature with respect for all life forms
- A foundation of practical ecological knowledge
- A sense of belonging to a special human niche within the natural world
- A feeling of accountability for human impacts upon the environment
- Sensitivity towards diverse interests and cultural perspectives
- The skills to identify and resolve environmental problems

US Fish & Wildlife Service

The Fish and Wildlife Service (FWS), within the U.S. Department of the Interior, is the principal agency through which the United States government carries out its responsibilities to care for the country's wildlife and their habitats. Migratory birds, endangered species, certain marine mammals, and freshwater and anadromous fish are all wildlife resources managed by the FWS. Some of the natural resource programs within the agency include:

Endangered Species

The FWS leads the Federal effort to protect and restore animals and plants that are in danger of extinction both in the United States and worldwide. Using the best scientific evidence available, FWS biologists identify species that appear to be endangered or threatened. After review, species may be placed on the Interior Department's official "List of Endangered and Threatened Wildlife and Plants." FWS biologists, along with other partners, then develop recovery plans for the species that include research, habitat preservation and management, and other recovery activities.

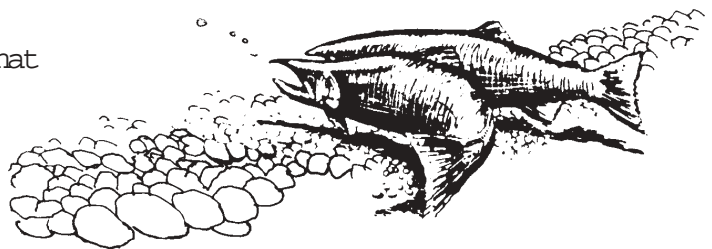


Migratory Birds

Because many bird species fly thousands of miles in their annual migrations, conservation by any single state or nation alone is not possible; cooperative efforts by each are required. The United States government is responsible for coordinating migratory bird conservation under several laws and international treaties with Canada, Mexico, Japan and Russia. The FWS is responsible for the conservation of more than 800 species of migratory birds; it regulates hunting, studies bird populations, and acquires and manages many national wildlife refuges to provide secure habitat for migratory birds.

Fisheries

Restoring nationally significant fisheries that have been depleted by overfishing, pollution or habitat damage is a major effort of the FWS. Research laboratories study fish health, genetics, ecology, nutrition and other topics to provide the information needed to raise fish in hatcheries and restore wild fish populations. As part of this program, nearly 80 national fish hatcheries produce some 50 species of fish. The FWS stocks more than 160 million fish annually.



Federal Aid

Through a system of excise taxes on fishing and hunting equipment, more than \$50 million per year is distributed to states for fish and wildlife management. Grants to states fund the purchase and development of critical habitat and research on endangered species.

The mission of the U.S. Fish & Wildlife Service is to conserve, protect and enhance fish and wildlife and their habitats for the continuing benefit of people.

Law Enforcement

The FWS enforces Federal laws that protect endangered species, migratory birds, marine mammals, and fisheries. The FWS carries out U.S. enforcement obligations under international agreements. Special agents work to prevent exploitation of game and nongame species, such as the interstate transportation of illegally taken wildlife. Wildlife inspector stations at major ports of entry check the legality of documents and permits and inspect shipments of live animals and wildlife products to ensure that protected species are not imported or exported illegally.

National Wildlife Refuge System

The National Wildlife Refuge System is the world's largest and most diverse collection of lands and waterways set aside specifically for wildlife. Over 530 refuges stretch across the continent and over to the Pacific Islands. They range in size from Minnesota's tiny Mille Lacs (less than 1 acre) to Alaska's sprawling Yukon Delta (approximately 20 million acres). Many early refuges were created for herons, egrets and other water birds. Others were set aside for large mammals like elk and bison. But most have been created to protect migratory waterfowl. Today, national wildlife refuges play a vital role in preserving endangered and threatened species. They provide secure habitat for native plants and many species of resident mammals, fish, insects, amphibians and reptiles. National wildlife refuges offer a wide variety of recreational opportunities, and many refuges have visitor centers, wildlife trails and environmental education programs. Small or large, each refuge provides vital habitat for at least a portion of America's wildlife populations.



Nisqually National Wildlife Refuge

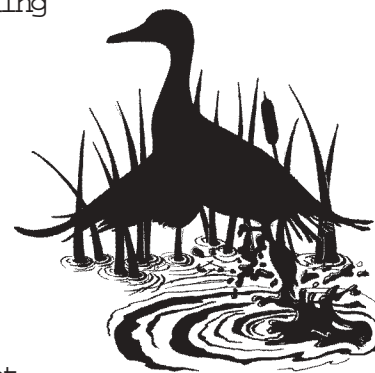
Nisqually National Wildlife Refuge (NWR) is located 8 miles northeast of Olympia, Washington on the biologically rich Nisqually River Delta. Here, the freshwater of the Nisqually River combines with the saltwater of Puget Sound to form an estuary rich in nutrients and detritus. These nutrients support a web of sea life – the benefits of which extend throughout Puget Sound and beyond.



Together with McAllister and Red Salmon Creeks, the Nisqually River forms one of the largest remaining relatively undisturbed estuaries in Washington. Although most major estuaries in Washington have been filled, dredged or developed, the estuary of the Nisqually River has been set aside especially for wildlife. In 1974, Nisqually NWR was established to protect the delta and its diversity of fish and wildlife habitats. These diverse habitat types include salt marsh and mud flats, freshwater marshes, estuary, grasslands and woodlands.

As surrounding wildlife habitat is lost to development, Nisqually NWR becomes an increasingly important place for wildlife, especially migratory birds. For some birds, the Refuge is a place to feed and rest before continuing on, while for others it is the end of their season's journey.

Over 300 species of birds, mammals, fish, reptiles and amphibians inhabit Nisqually NWR, making it an excellent place to observe and study wildlife. The Refuge provides abundant opportunities for wildlife-dependent recreation. Hiking, wildlife observation, wildlife photography, fishing and environmental education all allow visitors to learn more about the natural world and the importance of places rich in beauty and biological diversity. National Wildlife Refuges are set aside specifically to provide and protect habitat for wildlife. Refuge managers take care to ensure the activities of refuge visitors do not conflict with the needs of the wildlife using the refuge.



A History of the Refuge

The Nisqually River flows 78 miles from its source at the Nisqually Glacier on Mount Rainier to the Nisqually Delta on Puget Sound. The river, and particularly the delta, provide a link between the alpine snows and rains of the Cascade Mountains and the marine waters of Puget Sound. It remains one of the most pristine rivers in Washington State.

The first people to inhabit the place that is now the Nisqually National Wildlife Refuge were the ancestors of the Nisqually Tribe. For thousands of years, they fished the Nisqually River, building seasonal villages along its banks. The Nisqually also used the estuary and mudflats to harvest shellfish.

1830's and 40's – Hudson's Bay Company established Fort Nisqually and began farming in the area.

1846 – The McAllister and Shazer families began farming the Nisqually delta. The McAllister family lived for a year in the trunks of a few cedar trees while building their log cabin.

1854 – Medicine Creek Treaty signed at the Treaty Tree just north of I-5. This treaty was signed on the banks of present-day McAllister Creek by representatives of all Native American tribes in the South Puget Sound area as well as representatives of the U.S. government, including Governor Stevens and the President of the United States. The treaty sought to end wars and establish fishing, hunting and reservation rights.

1904 – The delta area was sold to Mr. Brown, who constructed the dike to create more farmable land. The farm had a dairy, chickens, hogs, an orchard and honey bees, and produced hay for feed. The farm operated successfully for about 15 years under Brown's direction and was sold to several successive owners who continued to farm it sporadically for the next 50 years.

1967 – Washington Department of Fish & Wildlife (then Department of Game) purchased 616 acres of Delta tidelands and salt marshes.

1968 – The Brown farm was up for sale again. Farming on the delta wanes. The Port of Tacoma proposes to build a deep water port facility near the mouth of the Nisqually River. Margaret McKenny organized opposition to the proposal and catalyzed support for protection of the delta from resource degradation.

1974 – An extensive lobbying effort by local citizens, the Nisqually River Task Force, and the US Secretary of the Interior resulted in the purchase of Brown Farm and transfer to the US Fish & Wildlife Service for management as a National Wildlife Refuge. This also protected the delta from another plan to develop a landfill for Pierce and King counties' garbage.

Resource Management

Purpose

The Refuge was established in 1974 "...for use as an inviolate sanctuary, or for any other purpose, for migratory birds."

Refuge Goals

- To conserve, manage, restore and enhance native habitats and associated plant and wildlife species representative of the Puget Sound lowlands.
- To support recovery and protection efforts for Federal and State threatened and endangered species, species of concern, and their habitats.
- To provide quality environmental education opportunities focusing on the fish, wildlife and habitats of the Nisqually River delta and watershed.
- To provide quality wildlife-dependent recreation, interpretation and outreach opportunities to enhance public appreciation, understanding and enjoyment of fish, wildlife, habitats and cultural resources of the Nisqually River Delta and watershed.

Refuge Resources

- Migratory Birds
- Significant Wildlife Habitat
- Endangered and Threatened Species

Why is it necessary to manage the resources?

- Loss of habitat due to development
- Pollution from urban runoff, industrial and agricultural activities
- Introduction of nonnative plants and animals
- Trash such as styrofoam and fishing line

How does the Refuge staff manage these resources?

- Designs, develops and implements restoration plans to improve wildlife habitat
- Monitors the populations of endangered species and migratory birds
- Conducts programs to educate people about the value of the resources
- Acquires additional land to protect and restore
- Controls nonnative plants and animals
- Re-plants native species
- Controls water levels

How can students help the Refuge?

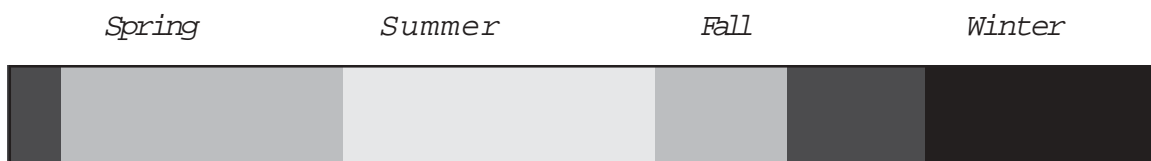
- Learn about habitats, endangered species and migratory birds, and teach others
- Never dump anything down storm drains and label storm drains with warnings
- Protect wildlife from pets by following regulations
- Teach others, including parents, about the Refuge
- Reduce, Reuse and Recycle
- Write letters to legislators

Seasons of the Refuge

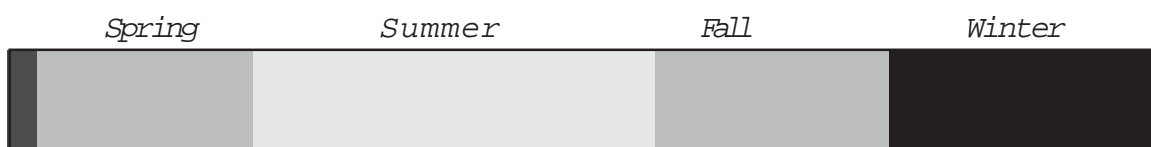
Nisqually National Wildlife Refuge means different things to different creatures. For some it's a place where they raise their young, or a stopover during migration. For others, it's a place to spend the winter or a year-round home. Visit Nisqually at many times of the year to enjoy an ever-changing panorama of wildlife. **The darker the graphs, the more birds there are!**

Spring = Mar-May *Summer* = Jun-Aug *Fall* = Sep-Nov *Winter* = Dec-Feb

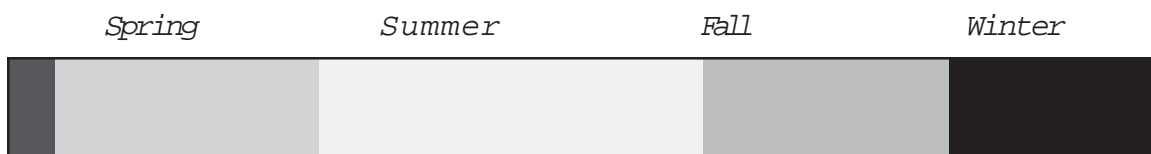
WATERFOWL



SHOREBIRDS



RAPTORS



SONGBIRDS



HERONS AND BITTERNS



Seasonal Scheduling

When are the best times to visit? What types of wildlife can be seen? Nisqually NWR is a good place to visit at all times of the year. The wildlife you see will depend on the season.

Spring (March-May)

The refuge receives most of its visits by school groups during the late spring (May). Visits at this time of the year usually provide good weather. Migrating songbirds move through the Refuge during the spring. Spring migrants include goldfinches, red-winged blackbirds and swallows. Watch for nesting Canada geese, red-tailed hawks, great blue herons, bald eagles and great horned owls.

Summer (June-August)

The best summer wildlife viewing is in the early morning or evening. Birds nesting on the Refuge in the spring can also be seen during the summer.

Fall (September-November)

By scheduling fields trips in the fall, educators will find fewer conflicts with other school groups than they would experience in May and June. Although many songbirds leave the Refuge for the winter, fall announces the arrival of Canada geese, wigeons, green-winged teals, mallards and raptors.

Winter (December-February)

Winter field trips can be a wonderful experience for groups, allowing them to combine environmental education activities with the opportunity to see large numbers of Canada geese and a variety of ducks. Bald eagles are also more abundant during this time. Groups need to be prepared for cold weather and/or rain during the winter.

Trail Distances and Times

Distances and approximate hiking times are from the visitor parking lot. Times indicated are for steady walking. *Add time to account for wildlife and habitat observation.*

<u>Trail</u>	<u>Distance</u>	<u>Time</u>
Brown Farm Dike Trail	5.5 mile loop	4 hours
To Observation Tower	4 miles round trip	3 hours
To Ring Dike Trail	2 miles round trip	1 hour
Twin Barns Loop Trail	1 mile loop	30 min.
To Riparian Forest Overlook	1/4 mile round trip	15 min.
To Nisqually Overlook	1 mile round trip	30 min.
To McAllister Creek	1.5 miles round trip	40 min.
To Twin Barns	1/2 mile one way	15 min.

Hiking Trails & Seasonal Trail Closures

The Refuge has approximately 7 miles of trails, including a 1 mile loop trail and a 5.5 mile loop trail. Trails provide views of wildlife habitats and access to the Education Center. Please stay on the observation decks and trails. Seasonal closures of trails occur throughout the year.

Brown Farm Dike Loop Trail (Seasonal)

This level 5.5 mile loop trail is on an earthen dike. The trail is wide with both gravel and dirt surfaces and can be muddy in some places. All the major types of habitat found at the Refuge can be seen from this trail. Walking the entire loop is not recommended for elementary school field trips.

To Observation Tower (Seasonal)

The observation tower is located 2 miles along the east side of the Brown Farm Dike Trail. The tower overlooks salt marsh and mud flats and can handle about 8 people.

To Ring Dike Trail and the Ring Dike Trail

The Ring Dike is a 1/2 mile trail located 1 mile along the east side of the Brown Farm Dike Trail. The east side of the Brown Farm Dike Trail follows along the Nisqually River. It offers views of a freshwater marsh.

Twin Barns Loop Trail

This level, mile-long boardwalk passes through woodlands, grasslands and freshwater marshes, past the Twin Barns and an observation platform. There are two spur trails off the main trail, the Riparian Forest Overlook and the Nisqually River Overlook. This trail also has a fork that meets up with the Education Center.

To Riparian Forest Overlook

A short trail to an observation deck branches off the east side of the Twin Barns Loop Trail. It curves through a surge plain, where tidal changes cause the Nisqually River to spill into a wooded habitat.

To Nisqually River Overlook

A little under 1/2 mile around the east side of the Twin Barns Loop Trail, the boardwalk extends for another 150 yards to the river. Here there is an observation deck with a mounted spotting scope for wildlife viewing along the Nisqually River.

To McAllister Creek

To get to McAllister Creek, walk along the south side of the Brown Farm Dike Trail for 3/4 miles. This section of the trail passes through grasslands and freshwater marshes.

Seasonal Trail Closures

Three miles of the Brown Farm Dike Trail between the Ring Dike Trail and McAllister Creek are closed during waterfowl hunting season from early October to late January (specific dates vary from year to year). The trail is closed because waterfowl hunting is allowed on Washington State Department of Fish & Wildlife lands adjacent to the Refuge trail. It is not safe to walk in the area, and closing the trail provides an undisturbed area for waterfowl.

Habitats of the Refuge

The Nisqually NWR comprises a mere 1% of the total Nisqually River watershed, but due to its diversity and richness of habitats, the Refuge supports more wildlife than any other area of the watershed.

Freshwater Marsh

The freshwater marsh around the visitor center and visitor parking lot was first created in 1970 by manipulating the flow of water from artesian wells inside the Brown Farm dike. The plants and animals in the freshwater marsh are adapted to constant contact with freshwater in the form of shallow and deep pools and ponds. Water levels in the shallow seasonal marshes are managed by the Refuge to be drier in the summer and refill in the fall. This management plan offers prime nesting and feeding habitat for migrating ducks. Refuge staff are continuing to restore this marsh by planting native species and removing invasive plants.

Over 75% of freshwater wetlands in the Puget Sound have been dredged, filled or diked. The Refuge's freshwater marshes provide important habitat to replace that which has been lost elsewhere.

Freshwater Marsh Birds, Animals and Plants

Birds

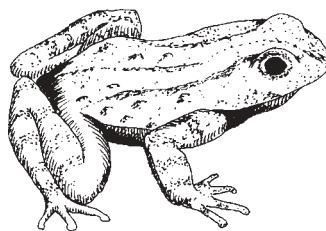
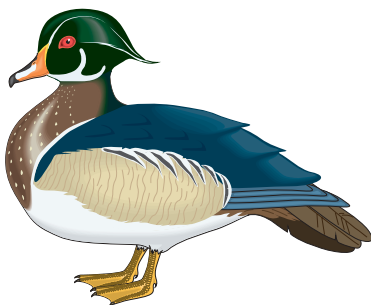
Mallard
Marsh Wren
American Bittern
Wood Duck
Pintail
Red-winged Blackbird
Hooded Merganser

Animals

Mink
Beaver
Black-tailed Deer
Red-legged Frog
Pacific Tree Frog
Bullfrog

Plants

Cattail
Reed Canarygrass
Duckweed
Pacific Willow
Bittersweet Nightshade
Crab Apple
Red Elderberry
Stinging Nettle



Habitats of the Refuge

Grassland

The grassland area, extending to the west and northwest of the Twin Barns Loop Trail, is a remnant from the days when the area was a farm. The hay it produces is now mowed every summer to provide green forage for Canada geese, wigeon and mallards during the fall and winter. Most of the plants in the grassland are non-native to the area, including cultivated pasture grass, annual and perennial orchard grass, clover, ryegrass and tall fescue.

Animals use the grassland for hunting. In particular, red-tailed hawks and Northern harriers hunt for mice and voles.

Grassland Birds, Animals and Plants

Birds

Red-tailed Hawk
Northern Harrier
Bald Eagles
Canada Goose
Mallard
American Wigeon

Animals

Deer Mice
Townsend's Vole
Red-legged Frog
Pacific Tree Frog
Garter Snake

Plants

Black Medic
Creeping Bentgrass
Reed Canarygrass
Velvet Grass
Canada Thistle

Shrub

Brush rows along ditches, sloughs and the Brown Farm Dike provide blackberries, rosehips and crab apples for migrating song birds such as thrushes. The thick brush also provides year-round shelter for sparrows, towhees and juncos.

Shrub Birds, Animals and Plants

Birds

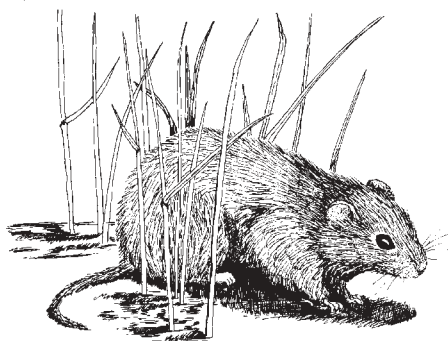
Sparrows
Spotted Towhee
Dark-eyed Junco
Thrushes
Kinglets
Chickadees

Animals

Deer Mice
Townsend Voles

Plants

Blackberry
Crab Apple
Bittersweet Nightshade
Rosehips
Snowberries



Habitats of the Refuge

Riparian Woodland

The Riparian Overlook Trail winds through alder and black cottonwood groves. The plants and animals of this forest must be able to survive tidal influences on the Nisqually River. This forest is one of the rare, naturally-occurring, deciduous riparian forests found in Western Washington. Drought or flooding, erosion or choking silt – all are common and the habitat can change rapidly. Tidal changes in the river and sloughs bring a twice daily wash of mixed salt and fresh waters, as well as rich life-giving organic matter called detritus. Animals may move to high ground or be adapted to swim in water, while plants adapt to survive periodic flooding and retain moisture when the waters recede.

Riparian Woodland Birds, Animals and Plants

Birds

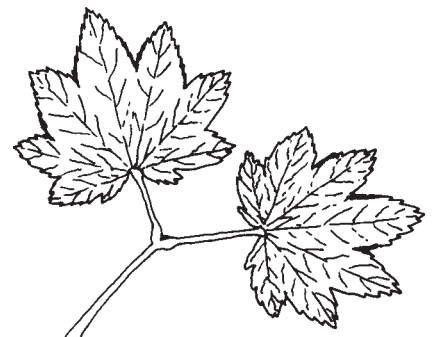
Great Horned Owl
Hooded Merganser
Wood Duck
Mallard
Woodpeckers
Yellow-rumped Warbler
Swainson's Thrush

Animals

Beaver
Millipede
Mosquito
Red-legged Frog
Pacific Tree Frog
River Otter
Sow Bug
Satyr Angleming
Rough-Skinned Newt
Caterpillars

Plants

Black Cottonwood
Red Alder
Big Leaf Maple
Skunk Cabbage
Scouring Rush
Moss
Lady Fern
Licorice Fern
Stinging Nettle
Snowberry
Oregon Ash
Willow
Salmon Berry



Habitats of the Refuge

Woodland

Along the east side of the Twin Barns Loop Trail runs a semi-natural woodland. This area was once similar to the riparian forest, but was logged, diked and farmed. Second growth trees now form the woodland, including native species such as red alder, black cottonwood and big leaf maple. Some snags (dead, standing trees) still remain in the woodland and provide nesting habitat for swallows and forage for woodpeckers.

Many of the understory plants are a mix of nonnative plants like the Himalayan blackberry and English ivy. This area is undergoing restoration work by Refuge managers, including cleaning, contouring and replanting with more native plants.

Woodland Birds, Animals and Plants

Birds

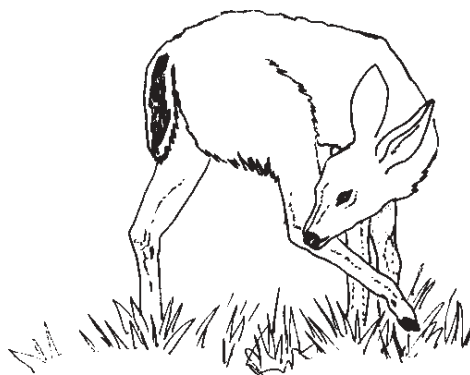
Great Horned Owl
Hooded Merganser
Bufflehead
Woodpeckers
Swallows
Sparrows
Swainson's Thrush
Peregrine Falcon
Black-Capped Chickadee

Animals

Black-tailed Deer
Red-legged Frog
Pacific Tree Frog
Mink
Long-tailed Weasel

Plants

Black Cottonwood
Red Alder
Big Leaf Maple
Himalayan Blackberry
Stinging Nettle
Snowberry
Oregon Ash
Willow



Coniferous Forest

Tall Douglas firs have regrown on the western bluffs overlooking the delta. This area used to contain an old growth forest which was logged many years ago. Bald Eagles use the tall firs as lookouts. One pair nests here every spring.

Habitats of the Refuge

River

The Nisqually River's source is the Nisqually Glacier on Mount Rainier. The river gathers water from other tributary streams and slows and widens as it reaches the delta. The delta has been formed by the river carrying and dropping sediment as it slows to meet the Puget Sound. The river is notorious for flooding and the dike has been breached several times, including the most recent floods in 1995-96. The Nisqually River is a critical habitat for endangered and threatened salmon runs.

The River Overlook provides a great view of the river, including an area influenced by salt water from the Puget Sound. During fishing season, Nisqually Tribal fishing floats are visible in the water.

River Birds, Animals and Fish

Birds

Mergansers
Double-crested Cormorant
Great Blue Heron
Belted Kingfisher
Mallard

Animals

River Otter
Harbor Seal
Black-tailed Deer
Beaver

Fish

Chum Salmon
Chinook Salmon
Coho Salmon
Pink Salmon
Steelhead

Salt Marsh

Where the freshwater of the Nisqually River meets the salt water of the Puget Sound a rich habitat called an estuary, or salt marsh, is created. *One square yard of estuary can contain 100 clams, 2,000 worms and 30,000 amphipods!* This habitat provides rich nutrients and sediment for plants, animals and invertebrates. The invertebrates, such as clams and worms, filter microscopic organisms from the water.

Plants and animals, however, must adapt to handle excess salt. Some examples are the Puget Sound gumweed and pickleweed, which sweat out salt through evaporating pores in their leaves. This process deposits a salt film or dusting on the leaves. Tides also flood many channels and sloughs, providing habitat and food for salmon fry before they head out to the Sound, as well as adults returning to spawn. These fish provide food for birds such as great blue heron, hooded merganser and grebes.

Salt Marsh Birds, Animals and Plants

Birds

Grebes
Great Blue Heron
Common Merganser
Caspian Tern
Glaucous-winged Gull
Bufflehead

Animals/Fish

Clams
Crab
Amphipod
Salmon (see river species)
Steelhead
Lugworm

Plants

Puget Sound Gumweed
Lyndbys Sedge
Tufted Hairgrass
Pickleweed

Habitats of the Refuge

Mudflats

The Nisqually River and McAllister Creek continually drop sediment on some 1,000 acres the mudflats. This area is rich in invertebrates, including worms, clams and crustaceans (crabs). During spring and fall migrations shorebirds gather to feed on this wealth of invertebrates.

Mudflat Birds, Animals and Plants

Birds

Western Sandpiper
Dunlin
American Wigeon
Greater Yellowlegs

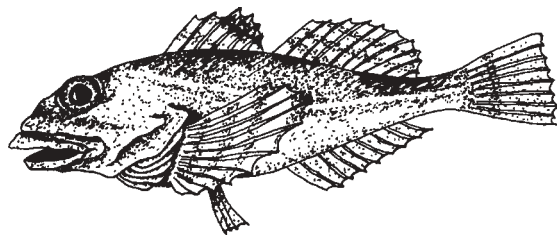


Animals/Fish

Amphipod
Threadworm
Midge Larvae
Fly Larvae
Clam
Snail
Sculpin
Stickleback

Plants

Sea Lettuce
Phytoplankton



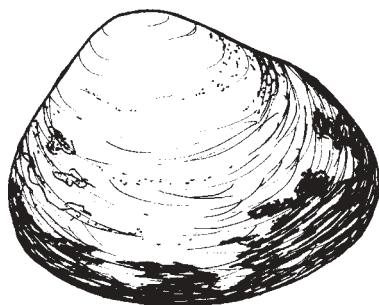
Open Salt Water

The Nisqually NWR boundaries include the deep waters of the Nisqually Reach and Puget Sound. Here, the marine environment takes over. Harbor seals hunt for flounder and Dungeness crab. Scaup and surf scoters feed on clams, while American wigeon rest and feed on sea lettuce (algae).

Marine Birds, Animals and Plants

Birds

Scaup
Surf Scoter
American Wigeon
Glaucous-winged Gull

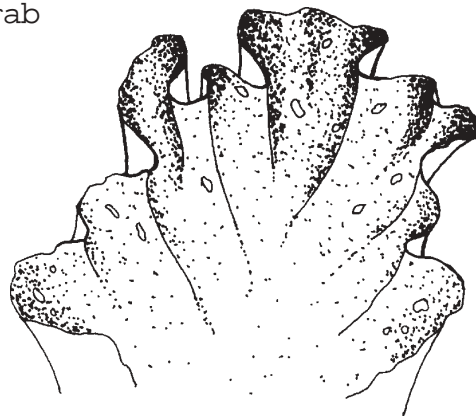


Animals/Fish

Harbor Seal
Flounder
Clam
Dungeness Crab
Salmon
Steelhead

Plants

Sea Lettuce (Algae)
Phytoplankton



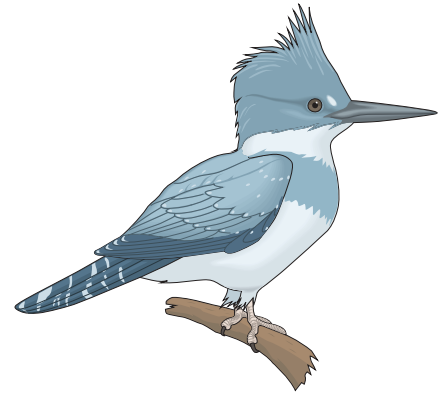
Birds of the Refuge

The following list, although not complete, describes some of the birds most commonly seen in each of the refuge habitats. Drawings are not to scale. For a complete list see the enclosed Bird Checklist. The checklist is also available online at nisqually.fws.gov.

Freshwater Marsh Habitat

Belted Kingfisher (*Ceryle alcyon*)

The kingfisher dives from the air, head first, into the water to catch fish with its long beak. They nest in tunnels dug into the banks of rivers and lakes. It is gray on its head and back with a gray band across its white breast. The female also has a rusty colored band. Belted kingfishers can also be found along the Nisqually River.



Cinnamon Teal (*Anas cyaoptera*)

Male cinnamon teal have cinnamon heads, neck and underparts. The female is brown. Males older than 8 weeks have red-orange eyes, yellowish legs and bright blue on their wings. They are common in marshes, ponds and lakes.

Common Yellowthroat (*Geothlypis trichas*)

The male common yellowthroat has a broad black mask and a bright yellow throat and breast. The female lacks the black mask and is more olive color. They can be found in grassy fields, shrubs and marshes; it nests on the ground. It often holds its tail cocked like a wren. Its song is a loud, rolling *wichity wichity wichity wich*.



Great Blue Heron (*Ardea herodias*)

One of the larger wading birds, the great blue heron stands 4 feet tall. It is slate blue with a white head, a black stripe extending above the eyes, and a white fore neck streaked with black. The great blue is graceful and majestic, as are all herons. They eat fish, frogs and mice (spears fish and flips them upwards, catching them in midair), and are residents of freshwater marshes. They can also be found along the Nisqually River.

Birds of the Refuge

Freshwater Marsh Habitat

Mallard (*Anas platyrhynchos*)

The male is identified by his metallic green head and neck, yellow bill, narrow white collar, and chestnut breast. Black tail feathers curl up. A "puddle duck" that feeds with its tail in the air and head underwater. The mallard can be observed in a variety of wetland habitats.



Marsh Wren (*Cistothorus palustris*)

This little bird has a brown crown, bold white eye line, black triangle on upper back streaked with white, and underparts that are mostly white. The marsh wren's call sounds like a lawn sprinkler *whish, whish*. It is found in reedy freshwater marshes.

Northern Shoveler (*Anas clypeata*)

The shoveler has a large, spatula-like bill that is longer than its head. The male has a green head, white breast, and brown sides; females have a grayish bill tinged with orange. It is found in ponds, marshes and bays.



Pied-billed Grebe (*Podilymbus podiceps*)

The pied-billed grebe is a small, stocky brown bird with a black ring around its stout whitish bill, a black chin and throat, and pale belly. It nests around marshy ponds and sloughs and tends to hide from intruders by sinking like a submarine until only its head shows. Grebes spit up pellets of indigestible materials, such as bones, like owls do.

Red-winged Blackbird (*Agelaius phoeniceus*)

In the spring, the red-winged blackbirds are commonly found nesting in the freshwater marsh. The males have a black body with red patch on the wings, while females are typically a browner, striped tone. Both have a relatively stocky body with rounded wings and a fairly short tail.



Wood Duck (see *Birds, Woodland Habitats*)

Birds of the Refuge

Grassland Habitats

American Goldfinch (*Carduelis tristis*)

This is a bright-yellow bird with a black cap and wings. It is common in flocks in weedy fields, bushes and roadsides, and in seed-bearing trees.

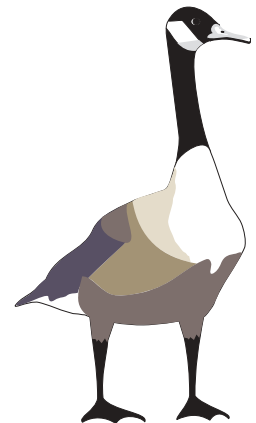


Barn Swallow (*Hirundo rustica*)

This swallow has an iridescent blue back, with a cinnamon-colored belly and throat. Most distinctive is its long, deeply forked tail. It makes open cup-shaped mud nests. If it can't find any mud, it makes its own by walking in water and then soil. It eats insects while flying.

Canada Goose (*Branta canadensis*)

The Canada goose is the most common and best-known goose. It is identified by the black head and neck and broad white cheek. It can be seen in large flocks, grazing in open fields within commuting distance of water. The refuge is inhabited by two subspecies which differ greatly in size and slightly in color, the western and cackling. The characteristic honking of the western is well-known.



Killdeer (*Charadrius vociferus*)

Killdeer have two black stripes on a white breast. They are common in fields and pastures as well as on shores and riverbanks. The killdeer eats insects, worms and grubs, and is a skilled actor, feigning injury near its nest to distract intruders.

Northern Harrier (*Circus cyaneus*)

Both sexes of the harrier have a distinct white area between the lower back and tail called a "white rump patch." Females are brown above and white below with dark streaks. Males are gray above and white underneath. They fly close to the ground searching for mice, rats, frogs, rabbits, small birds and other small prey.



Birds of the Refuge

Grassland Habitats

Peregrine Falcon (*Falco peregrinus*)

Large and stocky with pointed wings and short tail. The peregrine has a dark head, uniformly patterned underwing, and gray or dark barring on belly. The fastest diving bird, the peregrine dives on smaller birds at speeds of up to 200 miles per hour. Although no longer listed as an endangered species, the peregrine falcon is now considered threatened.



Woodland Habitats



Common Flicker (*Colaptes auratus*)

Flickers are jay-sized woodpeckers with brown back, no white on wings, and a black breast crescent. In flight, note the white rump, and salmon color under wings and tail. Often seen on the ground eating ants. It is common in open country near large trees. The call is a loud repeated *click* or *flicker*.

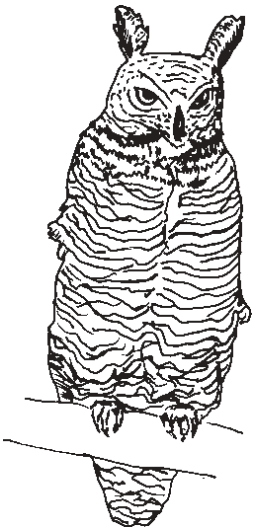
Dark-eyed Junco (*Junco hyemalis*)

Juncos are rather tame sparrows with light pink bills, gray or black hoods and white outer tail feathers that can be seen when they fly. Often seen in flocks, they hop on the ground and pick up small seeds. In winter, juncos are easily attracted to feeding stations.



Great Horned Owl (*Bubo virginianus*)

This large nocturnal owl is distinguished by its large ear tufts (feathers, actually, not ears!). The great horned owl will take prey as large as skunks and often preys on baby barn owls. Look for great horned owls near the Twin Barns.



American Goldfinch (see *Birds, Grassland Habitats*)

Belted Kingfisher (see *Birds, Freshwater Marsh Habitat*)

Birds of the Refuge

Woodland Habitats

Pileated Woodpecker (*Dryocopus pileatus*)

Prominent red crest, black with white under wings. The pileated woodpeckers eat insects from the trees in which they drill their nests. Once abandoned, their nests are then used by squirrels, swallows and wood ducks.



Rufous-sided Towhee (*Pipilo erythrophthalmus*)

This large, ground-feeding sparrow has rufous sides, a white belly, and a long rounded tail with large white spots. Its back is spotted with white. Towhees are commonly seen in brush, heavy undergrowth and wood margins. They hop with both feet together, and usually fly close to the ground.

Song Sparrow (*Melospiza melodia*)

Long, rounded tail, pumped in flight. Broad, grayish eyebrow and broad, dark stripe bordering whitish throat. Upper parts usually streaked. Breast also is heavily streaked, with lines converging at a central spot. Legs and feet are pinkish. Found in dense, brushy areas.

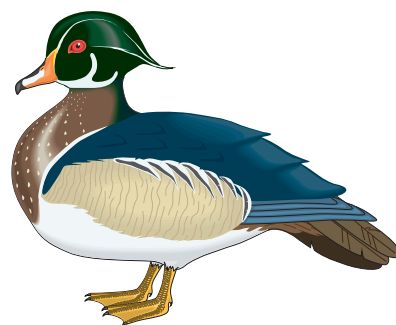


Red-breasted Nuthatch (*Sitta canadensis*)

A small acrobatic bird that climbs up, around or down a trunk head first. Its white face, solid black cap and black eye stripe are distinctive. Both males and females have a pale orange underbelly. Call is a weak, nasal *yenk*. Common in deciduous woodlands.

Wood Duck (*Aix sponsa*)

The large head, the short neck, and the long square tail are good field marks. No other duck has the long slicked-back crest. They feed on plant materials, from duckweed to acorns, and some insects. Nesting is in natural tree cavities or nest boxes. Fairly common in open woodlands near ponds or rivers.



Birds of the Refuge

Open Water Habitats

American Wigeon (*Anas americana*)

The wigeon is a surface feeding duck that eats mostly aquatic plants. In flight, wigeons are mostly brown with a white wing patch. The males have green and white on top of their heads.



Bald Eagle (*Haliaeetus leucocephalus*)

Adult bald eagles are readily identified by a white head and tail and huge yellow bill. Immature bald eagles are mostly dark brown; it takes four or five years for bald eagles to reach full adult plumage. It feeds mainly on fish. The bald eagle was an endangered species, but thanks to intense recovery programs populations are increasing.



Double-crested Cormorant (*Phalacrocorax auritus*)

Large, rounded throat pouch is orange year round. Double crests are seldom visible. Its body is black throughout. Kinked neck is distinctive in flight, flies with rapid wing beat. The cormorant is a resident along coast, lakes and estuaries.



Northern Pintail (*Anas acuta*)

When feeding, this dabbling duck "tips over" for its meal (plant matter) showing off its long tail feathers. The male has a chocolate brown head and white neck with a dark strip down the back. Black central tail feathers extend to form a "pintail."

Ring-billed Gull (*Larus delawarensis*)

Adults have black ring around yellow bill, greenish-yellow legs, pale-grey mantle, white head and underparts, and black primary feathers tipped with white spots. Their heads are streaked with brown in winter. These gulls mature in 3 years and acquire new and different plumage in each of their first three winters.



Northern Shoveler (see *Birds, Freshwater Marsh Habitat*)

Mallard (see *Birds, Freshwater Marsh Habitat*)

Pied-billed Grebe (see *Birds, Freshwater Marsh Habitat*)

Barn Swallow (see *Birds, Grassland Habitats*)

Mammals & Amphibians of the Refuge

The following list, although not complete, describes some of the animals most commonly seen on the refuge.

Beaver (*Castor canadensis*)

A mammal with long incisors, webbed feet and long flat tail. Beavers construct dams for homes in lakes and streams by chewing down trees with their large teeth. Usually very shy and most active at night, they can be difficult to see.

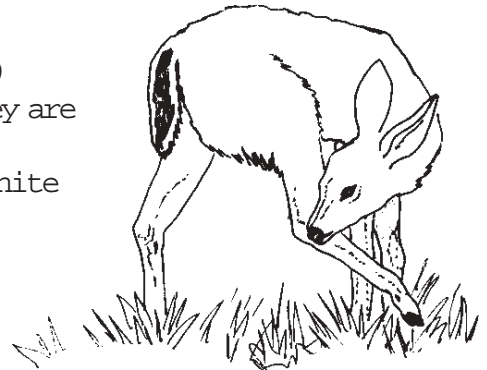


Coyote (*Canis latrans*)

Coyotes have large pointed ears and a fluffy tail. About the size of a large domesticated dog, their tracks can be mistaken for those of domesticated dogs. Coyotes eat small rodents, hares, Canada geese and sometimes larger animals such as newborn fawns.

Black-tailed Deer (*Odocoileus hemionus columbianus*)

Black-tailed deer usually stay within the area where they are born. Males grow branching antlers. Both males and females have dark brown or black flattened tails with white underneath. Like all deer, black-tailed deer browse exclusively on vegetation such as salal, huckleberry, blackberry, bitterbush and snowbrush.



Northern Red-legged Frog (*Rana aurora aurora*)

Adults are up to 10 cm in length. Upper surface and sides are usually reddish brown, with a few dark spots or blotches, while underside of belly and inner legs are a pinkish red. Lives in or near marshes, streams and ponds, and is usually voiceless.

Pacific Treefrog (*Hyla regilla*)

Adults are about 4 cm long and can range in color from green to brown to gray. Typically have dark blotches on legs and are characterized by a white-bordered dark streak running through each eye. Their call sounds something like *wreck-it*. Pacific treefrogs, like most treefrogs, have sticky finger pads that allow them to grip onto the tree.



Mammals & Amphibians of the Refuge

Mink (*Mustela vison*)

Mammals up to the size of a small house cat, minks have a long slender body, short legs, slender tail and dark brown fur. They can be found around freshwater marshes, streams and lakes. Mink eat muskrats, voles, fish, shorebirds, young ducks and amphibians. Main predators of mink are humans (for their fur), hawks and owls.

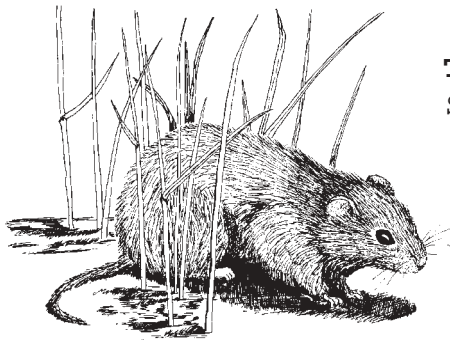


Deer Mice (*Peromyscus maniculatus*)

A small mouse with large membranous ears. Deer mice primarily eat seeds and fruit and can be found in grassland, shrub and woodland habitats. They are preyed upon by raptors and owls.

River Otter (*Lutra canadensis*)

Fur-bearing mammal with large canine teeth, long slender body, short legs, four webbed feet and a long tail covered with dense fur. Live in streams, large lakes, rivers and sea coasts. River otters eat a variety of fish, frogs, and occasionally small diving birds and small mammals. They can dive 60 feet below water surface and stay underwater for up to 4 minutes.



Townsend's Vole (*Microtus townsendi*)

Small mouse-like mammal with rounded nose, short bi-colored tail, and long front teeth for gnawing. Voles are most commonly found in the grassland and woodland areas and eat seeds, roots, berries and mushrooms. They are important to many plants because they help scatter seeds and spores, and the tunnels voles create in the soil aides water absorption.

Plants of the Refuge

The following, although not complete, describes some of the most commonly seen plants in each of the Refuge habitats. Poisonous plants such as stinging nettles, bittersweet nightshade and poison hemlock are described in the next section under medical considerations.

Freshwater Marsh Habitat

Pacific Willow (*Salix lasiandra*)

The Pacific willow tree can grow up to 20 meters tall. The bark of the trunk is dark gray to dark brown. The leaves are narrow and long tapering to a slender tip. The tree also produces male and female catkins which appear yellow and hairy.



Duckweed (*Callitriche heterophylla*)

Forms continuous mats (each leaf less than 1 cm wide) in shallow water. The mats appear free-floating, but are rooted in the mud.

Cattails (*Typha latifolia*)

Leaves grow around base of the main stems. The top of these stems form the characteristic "cattail," which is made up of male and female flowers. Cattails are found primarily in permanent wetlands growing in standing water and can reach a height of 3 meters.



Reed Canarygrass (*Phalaris arundinacea*)

One of the most invasive grass species in the Pacific Northwest, reed canarygrass grows as a dense thicket in wetlands. The plant's stems are usually 1 cm wide and can be up to 2 meters tall. The leaves are blue-green when fresh, straw-colored when dry.

Grassland & Shrub Habitats

The grassland contains mostly non-native grasses, which are often difficult to identify.

Black Medick (*Medicago lupulina*)

Low-growing plants that flower in the spring with violet flowers. Related to clover and often referred to as hop clover.



Plants of the Refuge



Canada Thistle (*Cirsium arvense*)

Spine-tipped leaves, spines less than 1 mm in length, with flowers that appear spiny and usually purple or reddish. Thistles have deep-seated, creeping roots that allow them to take hold easily.

Woodland Habitats

Black Cottonwood (*Populus balsamifera trichocarpa*)

Often found near rivers and in wet forest habitats, the deciduous black cottonwood has a heart-shaped leaf.



Red Alder (*Alnus rubra*)

The red alder is a common native deciduous tree with serrations along its leaf edges.

Big Leaf Maple (*Acer macrophyllum*)

A common Northwest deciduous tree, the big leaf maple can be identified by its leaf with its five distinct fingers.



Scouring Rush (*Equisetum hyemale affine*)

Related to the horsetail, the scouring rush is a plant often found in wetlands. The plant grows tall, green spikes composed of segments.

Skunk Cabbage (*Lysichiton americanum*)

Another common wetland plant, the skunk cabbage is so named for its skunky, musky odor. It has broad green leaves and blooms a bright yellow flower in spring (riparian forest only).



Snowberry/Waxberry (*Symphoricarpos albus*)

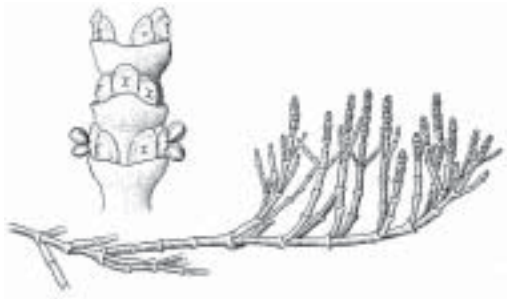
This shrub grows in the both the riparian forest and woodland areas. It can be easily identified by its small white berries.

Plants of the Refuge

Salt Marsh Habitat

Lyngby Sedge (*Carex lyngbyei*)

A common coastal, estuarine (salt water) plant species. It has tall, round stems with a purplish brown base. Has both male and female flower spikes (see close up) which bloom April through July.



Pickleweed (*Salicornia pacifica*)

Common in salt marshes throughout the Puget Sound. The stems of pickleweed are composed of short interlocking segments. The flowering stems are green with a reddish or purple cast and the flowers are tiny yellow clusters at the tips of the stems.

Puget Sound Gumweed (*Grindelia integrifolia macrophylla*)

A sticky succulent that emits a strong, musky-odor. The stems are stout and soft-hairy or nearly hairless. Blooms with sunflower-like flower heads. The Puget Sound gumweed is sticky with a white gummy sap.



Where the River Meets the Sound



Field Trip Preparation

Environmental Education Goals & Objectives

Key Ecological Concepts

Refuge Resources & Facilities

Making Reservations

Guidelines for Refuge Field Trips

Checklist for a Successful Field Trip

Group Management Tips

Medical Considerations

Field Trip Map

Reservation Application

"To look is one thing.

To see what you look at is another.

To understand what you see is a third.

To learn from what you understand is
still something else.

But to act on what you learn is all
that really matters."

— The Tahmud

Where the River Meets the Sound



Field Trip Preparation

The U.S. Fish & Wildlife Service educates the public about the environment in order to work together on conserving, protecting and enhancing plants, animals and their habitat. The Nisqually NWR environmental education program enables students young and old to learn the value of our ecosystems. When we collaborate with schools and other educational groups, we extend the learning process beyond conventional classroom limits and benefit society immeasurably.

Environmental Education Goals

- Respect for all life forms.
- A basic understanding of the total environment.
- A sense of belonging to a special human niche within the environment.
- A feeling of responsibility towards life and accountability for human impacts upon the environment.
- The skills to identify and resolve environmental problems.
- Participation in all levels of environmental stewardship.

Environmental Education Objectives

Awareness

To help individuals and groups acquire an awareness and sensitivity to the ecosystem – the total environment and its interactions.

Knowledge

To help individuals and social groups gain a variety of experiences in and acquire a basic understanding of the environment and its associated problems.

Attitudes

To help individuals and social groups acquire a set of values and feelings of concern for the environment and to help motivate them toward active participation in environmental improvement and protection.

Skills

To help individuals and social groups acquire the tools for identifying and solving environmental problems.

Participation

To provide individuals and social groups with an opportunity to be actively involved in all levels of working toward the resolution of environmental problems.

Key Ecological Concepts

• At the Refuge, wildlife needs come first.

Wildlife etiquette requires people to stay on the trails, to harvest nothing from the habitat, and to be quiet and unalarming. Wildlife depends upon habitat for food, shelter, safety, clean air and clean water.

• Healthy ecosystems are diverse.

A diversity of life indicates that the ecosystem is intact, and that plant and animal populations have a better chance of surviving in our changing environment.

• Organisms adapt to habitat conditions in order to survive.

Each habitat is its own mini ecosystem, providing different needs for different organisms.

• Life is interdependent.

Ecosystems exist in a delicate balance. A single change, such as an introduced species, can upset the balance and threaten plant and animal populations.

• Most birds migrate, flying north in the spring and south in the fall.

Birds use particular routes called flyways. Nisqually NWR is on the Pacific Flyway, and provides important feeding, nesting and resting for all sorts of birds. As habitat is lost to development, it is important to save these key habitats for migratory birds.

• Every living thing is born, matures and dies, transferring its energy to new life.

The process of birth, death and rebirth is reflected in the endless cycle of the seasons.

• The Nisqually Indians have hunted, fished and gathered food and materials in the Nisqually River watershed for thousands of years.

The Tribe ceded land rights to the United States in the famous Medicine Creek Treaty, right on the banks of McAllister Creek. Today, the Tribe owns land along the river and at the delta, fishes the Nisqually River and McAllister Creek, runs two salmon hatcheries on the Nisqually River, and takes a leadership role in land management.

• Nisqually National Wildlife Refuge came about through a grassroots effort to preserve habitat for wildlife.

Diking and farming in the past had changed much of the area from fluctuating fresh and salt water wetlands to habitat untouched by the tides. Today, habitat restoration enhances the habitat for migratory birds. People everywhere make decisions that affect wildlife. We are responsible for our impacts upon the environment.

Refuge Resources & Assistance

Field trips at the Refuge are teacher led. Group leaders are expected to plan and lead their own field trips. In order for students to have the most productive educational experience, it is recommended that teachers attend a field trip orientation workshop, visit the Refuge and walk the trails, and have clearly defined field trip goals.

Nisqually NWR does offer resources and assistance in meeting field trip learning objectives. Call Refuge staff for suggestions on how to organize groups, places to go, and activities to do. Some of the following additional services can be requested by checking the appropriate blank on the "Application for Reservations" form.

Orientation Talks by Volunteers

Refuge volunteers are available upon request to give brief (15-20 minutes) orientations to groups with reservations. In order for the Refuge staff and volunteers to orient their program towards your teaching goals, it is important that you fill in the sections on the reservation application entitled "Field Trip Goals," "Pre-Field Trip Activities," and "At-the-Refuge Activities."

Visitor Center

The Center is open Wed-Sun, 9:00 am to 4:00 pm. Visitors can request brochures, purchase passes and educational items, check out discovery packs, request to view a video, and contemplate the freshwater marsh. School groups (maximum of 10 at a time) may explore the interpretive exhibits on the Nisqually watershed, Pacific Flyway, Delta history, and Nisqually River salt marsh and estuary.

Refuge Facilities

Parking

Adjacent to the trail system and Visitor Center is a visitor parking lot, with space for buses.

Restrooms

Handicapped accessible restrooms, open during daylight hours, are across the deck from the Visitor Center. There are also sanikans outside next to the Twin Barns. *There are no restrooms along the trails.*

Drinking Fountains

There are drinking fountains across the deck from the Visitor Center, and in the Education Center. *There is no drinking water on the trails.*

Telephone

There is a pay phone across the deck from the Visitor Center, next to the restrooms.

Trash Cans

Although trash cans are located at the parking lot, Visitor Center and Education Center, we request you take all trash with you and recycle!

Education Center

The Education Center holds exhibits and hands-on activity classrooms. Groups are limited to 30 students at one time and must have reservations. Larger groups will be asked to split into smaller groups. The exhibits include a variety of bird mounts, a freshwater aquarium, and a display of nests and skulls. Viewing the exhibits takes 20-30 minutes. Each room has hands-on activities built around a particular theme (see On-Site Activities section). It takes about an hour to complete all the stations. *The activities are most appropriate for Grades 3-7.*

Making Reservations

In order to accommodate as many groups as possible, advanced registration is required for all school groups participating in the Refuge's environmental education program.

How Do I Register?

- Call the Refuge and ask to schedule a field trip. You will be sent an "Application for Reservation." Fill this out and send it to the Refuge.
- You will receive a confirmation of your registration and a teacher's packet from the Refuge.
- All reservations are made on a first-come, first-served basis.

Why are Reservations Required?

Nisqually National Wildlife Refuge is a popular place with limited facilities. By having teachers register their classes we can:

- Schedule classes so they do not conflict with another group. This reduces overcrowding of Refuge facilities, minimizes wildlife disturbance, and ensures a better opportunity for wildlife observation.
- Coordinate volunteers who provide orientations to groups.
- Provide better interpretive and educational programs.
- Determine the number of people participating in various activities on the Refuge. This information may be used to obtain funding for improvements to our public use programs.

How Many Groups May Visit Daily?

The number of groups may vary. However, the number of total students is limited to about 100 on any given day. This may be five groups of 20 students or two groups of 50. This is in addition to the individuals and families who do not have reservations.

Does Registration Guarantee a Visiting Date?

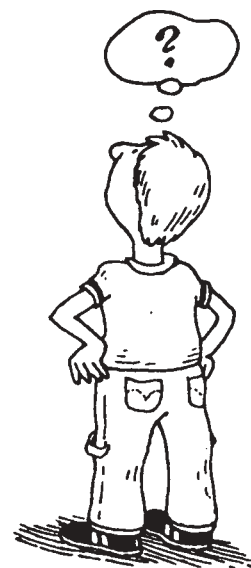
Yes, *if* you have obtained a confirmation in writing.

What About the Entrance Fee?

For a fee waiver, groups must meet the following criteria:

- The educational activity of the group is formally structured, with an approved course of study that focuses on the natural environment.
- The students are involved in a hands-on field activity on Refuge lands.

Groups that qualify for a fee waiver will have "exempt" stamped on their confirmation notice.



Guidelines for Refuge Field Trips

Certain rules are necessary to help protect the wildlife and facilities at Nisqually NWR:

Take Away Only Memories

All plants, animals and artifacts are protected. Students may take only photographs, drawings and memories.

Walk and Talk Quietly

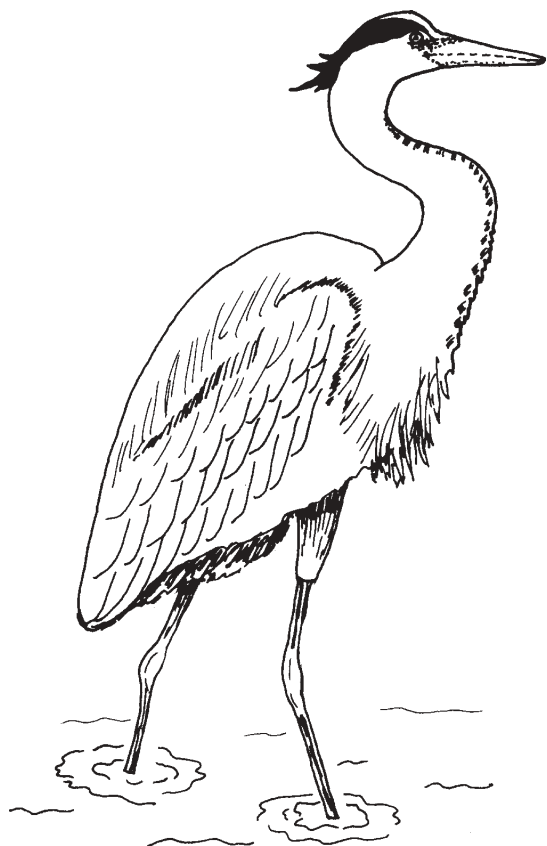
By walking slowly and quietly you greatly increase your opportunities to observe wildlife.

For Safety, Stay With the Group

Please stay with your group on the trails! Each group must be accompanied by an adult at all times, and for every ten students there must be at least two adults in attendance.

Be Aware of Your Trash

Avoid littering the trails, and make an effort to pick up any litter you see. Bring litter and recycling bags with you.



Education Center

Groups reserving the Education Center are expected to leave the place clean. This includes picking up trash, cleaning tables, and putting away chairs and activities. Please refrain from touching the bird mounts as the natural oil on your fingers can damage them.

Lunch

Lunches should be eaten outside, on the covered deck outside the Visitor Center, on the bus, or at the picnic tables located outside the Twin Barns or Education Center. The Education Center and Visitor Center are not available as a lunch room.

Help Protect the Wildlife

To prevent disturbances to wildlife, buses and private vehicles are not allowed on Refuge maintenance roads and trails without prior authorization.

Checklist for a Successful Field Trip

- ___ 1) Be familiar with the Refuge site, resources and background information. Attending a field trip orientation workshop or making a personal visit is highly recommended.
- ___ 2) Review the information in the Educator's Guide.
- ___ 3) Request an application to reserve your field trip date.
- ___ 4) Identify your objectives. What do you want students to learn? Develop lesson plans and activities that fit your curriculum and take advantage of students' interests. Design worksheets for your students to use during their field trip to enhance learning (optional).
- ___ 5) Have your schedule well thought out and coordinated with Refuge staff. Consider small group divisions, distribution of equipment, travel time, timing of activities, and rainy day alternative activities.
- ___ 6) Fax or mail your application to the Refuge at least 2 weeks before your visit.
- ___ 7) Receive confirmation form from Refuge staff by mail or fax. This will include a detailed itinerary and instructions.
- ___ 8) Arrange transportation.
- ___ 9) Recruit adult leaders who can assist with your field trip. A ratio of 2 adults for 10 students is required. Emphasize this is to be a fun-filled learning experience.
- ___ 10) Have students' parents visit the Refuge or arrange an informational meeting at your school. Make copies of maps and itinerary for each group leader.
- ___ 11) Proper dress is important. Ask students to bring a warm jacket or rain gear and to wear clothes they won't mind getting dirty. Students should wear sturdy walking shoes. If you need them to bring a bag, backpacks will free hands to write, point out interesting animals, and use binoculars.
- ___ 12) Don't forget lunches and water! Bring a bag for collecting lunch garbage. *There are no dumpsters at the Refuge.*
- ___ 13) Name tags with first names are helpful for students, group leaders and staff.
- ___ 14) Prepare students for their field trip. Let them know where they are going and the behavior expected of them. A Refuge is different from a park or playground.
- ___ 15) Arrive ready to follow your plan, and bring your confirmation form(s).

Group Management Tips

A great handout to copy for parent and group leaders.

If you have apprehensions about leading a group of children away from the four-walled constraints of a classroom, relax! There are several techniques you can use to keep the group's attention and maintain the feeling of freedom and open exploration.

Be Prepared!

Read over the activities before coming to the Refuge. The more comfortable you are, the more comfortable the students will be.

Be Enthusiastic!

Enthusiasm is a greater catalyst than knowing a bunch of names. Whatever you are doing, do it with gusto! Get down on your hands and knees to look at the plants. *As the leader, you set the tone for the students experience.*

Have a Focus

When you stop to look at something, focus on something concrete. Gather the group in a semicircle with everyone facing toward the object of attention.

Ask Questions

Encourage thinking and group interaction by asking questions; spark their imagination. For example, "Why is there a hole in the ground here?" "How did it get here?" "What would you need to live here if you were a _____?" Whenever possible, ask questions instead of giving information.

Speak with the Group

Speak loudly and clearly, facing the group. Talk with the group, not at it.

Make Eye Contact

Make eye contact with your students. If necessary, you should face the sun, rather than having the students look into the sun.

Be Patient with Answers

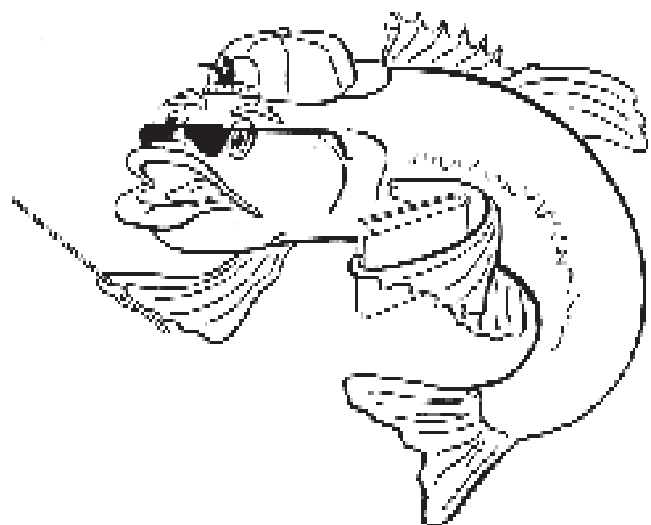
Give students time to think and answer questions. Count to 10 before revealing the answer.

Demonstrate

Keep it simple. Demonstrate an activity as you explain it.

Encourage Curiosity

Encourage your students to pursue their natural curiosity. Any observation they make is a good one. If they come up with questions you cannot answer, have them write them down; they can look up the answer or ask a staff member later.



Medical Considerations

Insect Stings

Because your trip to Nisqually NWR will be outdoors, educators should be prepared to deal with insect stings and bites. Teachers should know if any students are allergic to insect stings, and those with allergies should bring their own medications. Mosquitoes can be abundant during warmer months, so bring insect repellent.

Hay Fever and Asthma

Those with respiratory problems or allergies to pollen should bring medication. Wearing a respiratory mask may be helpful.

Poisonous Plants

Most plants on the Refuge are harmless. However, there are a few that can present serious problems to unwary visitors. Everyone should know what these poisonous plants look like. *Remember: Please leave the plants and berries for the wildlife of the Refuge.*

Poison Hemlock is extremely deadly if eaten or chewed. This plant can grow to be over six feet tall. The hollow, erect stem branches extensively and has purple-red splotches. The leaves look very similar to parsley, and the flowers are tiny, white, and numerous.



Poison Hemlock
Conium maculatum



Stinging Nettle
Urtica dioica

Stinging Nettles can be a nuisance to anyone who touches the plant, resulting in an itching, burning sensation for several hours or longer. This plant has strongly angular, unbranched stems. The leaves grow opposite on the stem with long stalks.

They have equally long, broadly heart-shaped blades with very prominent hairs. Nettles can grow to more than six feet in height and are found mostly in moist, shady places.

Bittersweet Nightshade can be found along some ponds and streams. *The bright red berries are poisonous.* The berries change from green to yellow and orange and finally to red when ripe. The leaves of this plant vary in shape, but usually are pear-shaped and may have two ear-like lobes at the base of the blade. The blue or violet flowers branch laterally from the main stem. The stamens are deep yellow, projecting beak-like from the center of the flower.

Bittersweet Nightshade
Solanum dulcamara



Emergencies

For emergencies, a telephone (360) 753-9467 is located at the Refuge Visitor Center or Administrative Office. The Visitor Center is open Wednesday through Sunday, 9:00 am to 4:00 pm, and the Office is open Monday through Friday, 7:30 am to 4:00 pm. Or, use the public phone outside the Visitor Center to dial 911.

Where the River Meets the Sound



Pre-Field Trip Activities

Preparing Students for the Field Trip

Sensing Nature

Habitats & Food Chains

Trace Your Trash

How to Pack a No-Trash Lunch

"Believe one who knows; you will find something greater in woods than in books. Trees and stones will teach you that which you can never learn from masters."

— Saint Bernard de Clairvaux

Preparing Students for the Field Trip

Overview

In this activity, students will locate the Refuge on a map. They will also discuss what they want to learn on the field trip, how to behave, and what to wear and bring.

Duration

50 minutes

Grades

3-7

Key Concepts

During the field trip, students will be exploring outside, in Refuge habitats. Students need to follow rules established to protect them and the habitats. Students should also demonstrate positive behavior, in order to have a more rewarding and educational day.

Objectives

Students will be able to:

- describe where Nisqually National Wildlife Refuge is located.
- name at least one thing they want to learn on the field trip.

Materials

Part 1: road map of the Puget Sound

Part 2: 2 large sheets of paper hung on the wall

Part 3: 1 large sheet of paper hung on the wall

Part 5: copies of endangered and threatened species name tags on pg. 43

Essential Academic

Learning Requirements

Communication 1.1, 1.2, 3.1, 3.2, 3.3; Geography 1.1, 3.1

Adapted from "Preparing Students for the Field Trip," Salt Marsh Manual

Part 1: Where Are We Going? (10 min)

Do

Hang a map of the Puget Sound, Washington State and the United States on the wall.

Read

"We are going on a field trip to Nisqually National Wildlife Refuge on (day of field trip)."

Ask

"Does anyone know where the Refuge is? Can anyone point it out on the map?"

(Allow students to come up to the map and point out the Refuge. The Refuge is in the Nisqually Valley, north of I-5 between the cities of Dupont and Lacey – on larger maps, between Tacoma and Olympia.)

Part 2: What Do We Want to Learn? (15 min)

Do

Put up large pieces of paper and label the first one: "What do we know?"

Read

"On our field trip, we are going to be studying the habitats and wildlife of Nisqually National Wildlife Refuge. Let's make a list of what we already know about this area."

Do

Write down things that the students may already know about wetlands, estuaries, the Nisqually River and wildlife at the Refuge. Include things that may be incorrect. Ask questions in order to get more ideas, such as:

"Can you think of any plants or animals that live in the wetlands around the Refuge?"

"What is a definition for habitats or wetlands?"

"Why are they important?"

"Why does the Refuge exist?"

"What are ways that we can help wildlife and habitats?"

Do

Label the second piece of paper: "What do we want to learn on the field trip?"

Read

"During the field trip, we will have the opportunity to study the wildlife and habitats of Nisqually Refuge. What do you want to know about the wildlife and habitats?"

Do

Write down what the students want to learn on their field trip. Copy these down onto a sheet of paper to bring along on the field trip, to make sure all of the questions are answered. After the field trip, refer back to these sheets of paper. Check to see that all of the things students already knew were correct and that all of the questions were answered.

Part 3: How Should We Behave? (15 min)

Do

Review the "Guidelines for Refuge Field Trips" on page 33 with the students. Ask the students what behavior they think will be appropriate and write down their ideas on the board or on another large sheet of paper. Help them fill in the points they miss. In this way, students will come up with their own rules and will be more likely to follow them. Please remind students that a National Wildlife Refuge is a protected area: a special place for plants and animals, a place for people to learn about plants and animals.

Do

Go over the following 'life skills' with the students before the field trip. 'Life skills': provide order; promote self-esteem; prepare students for the real world; need to be recognized and valued by students; and need to be developed and experienced by students.

Effort: Do your best.

Curiosity: A desire to investigate and seek understanding of one's world.

Cooperation: To work together for a common goal.

Caring: To feel and show concern for others and for the environment.

Respect: To recognize the value of others and of the environment.

Responsibility: To be accountable for your actions.

Part 4: What Do We Need to Bring? (10 min)

Do

Before the field trip, remind students about the following (this could also be included in a letter home):

- Wear clothes that can get dirty.
- Wear shoes that cover the entire foot, can get dirty, and are good for walking.
- Bring a jacket or sweater, it can be windy and cold.
- Bring rain gear if it looks like rain. Warmer clothes like hats and gloves for the winter.
- Bring your own lunch, and try to pack a no-trash lunch (a lunch box and reusable containers).
- Wear a hat and/or sunscreen.
- Bring a water bottle.

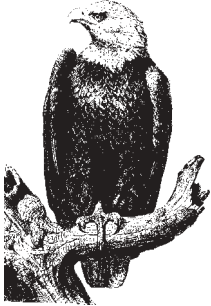





Part 5: Name Tags (optional)

Do

Divide students into groups of 5. Make copies of the threatened and endangered species name tags on page 43 and cut apart. Use one animal for each group. Write the students first name on their name tag or hand out and have students write on them. Use safety pins, yarn or tape to attach and give chaperones the same name tag as their group.

Nametags

Threatened and Endangered Species of Nisqually National Wildlife Refuge

<p>Bald Eagle <i>Threatened</i></p> 	<p>Chinook Salmon <i>Threatened</i></p> 
<p>Stellar Sea Lion <i>Threatened</i></p> 	<p>Peregrine Falcon <i>Threatened</i></p> 
<p>Pileated Woodpecker <i>State Candidate</i></p> 	<p>Purple Martin <i>State Candidate</i></p> 

Extension K-2

Instead of using map discuss that Nisqually NWR is a protected place to make sure animals have a place left, just like you have a place in your community. What do you get at your home? (food, water, shelter, space) Nisqually NWR is set aside to make sure animals get these things. What sort of behavior will be appropriate in visiting a place protected for animals? (no running, no yelling, picking up and removing your trash, staying on trails to protect their homes, etc.) What sorts of things will we need to bring? (weather-appropriate clothing, sturdy shoes, water, food, and a hat)

Sensing Nature

Overview

In this activity, students will take part in several activities to practice using their senses and then use their senses to observe nature.

Duration

1 hour (can be broken into two 30 minute sessions)

Grades

K-6

Key Concepts

People observe nature with all five of their senses. Students can improve their observation skills in preparation for the field trip by focusing on all five of the senses and expressing their observations through art, poetry and music.

Objectives

Students will be able to:

- Identify their five senses
- Describe how to use their senses to observe nature.

Materials

Part 1: Our Five Senses

- sweet-scented flower
- a few oranges, apples and/or bananas
- paper napkins

Extension: Calling All Birds

- opaque film containers (one per student; fill each pair with different small objects such as paper clips, erasers, push pins, etc.)

Essential Academic

Learning Requirements

Communication 1.1, 1.2;

Science 2.1, 3.1; Geography

3.1, 3.3; Health and Fitness

1.1, 1.2

Background

- We use sight, smell, hearing, taste and touch as our five sensory tools to perceive the world around us.
- There is a tendency to focus on sight and hearing, with books, videos and discussions, however, experiences that engage many senses lead to greater brain activity and physiological growth of the brain.
- Observing nature can be a highly sensory experience and thus, a memorable experience. Teachers can enhance the field trip experience by making students more aware of their "sensing" abilities.

The Five Senses

- 1) Eyes are sensitive to external light. Light passes through the cornea, a clear covering of the eye, before reaching the pupil. Behind the pupil is a lens that focuses light. The cornea, pupil, lens and other structures at the front of the eye direct light to receptors in the retina, at the rear of the eye the receptors transmit the information to the brain, which interprets it for us.
- 2) The olfactory nerve is responsible for producing our sense of smell. Branches of this nerve are located in the nasal passage. The olfactory nerve sends messages to the brain, which interprets the smell.
- 3) Sound waves enter the ear, travel through the auditory canal, and reach the eardrum, causing it to vibrate. The vibrations are transmitted by three tiny bones (the hammer, anvil and stirrup) to the inner ear. Organs within the inner ear transmit the vibrations to receptors at the end of the auditory nerve, which sends the information to the brain.
- 4) Specialized receptors located on the taste buds of the tongue enable us to sense sour, sweet, salty and bitter foods. These receptors, like those of sight, smell and sound, transmit the information to the brain for interpretation.
- 5) Using mostly our hands, the sense of touch gives us information about texture (smooth, prickly, rough, bumpy), weight (heavy, light) and density (squishy, soft, hard).

Adapted from "Sensing Nature," Salt Marsh Manual

Part 1: Our Five Senses (20 Min)

Do

Begin with a Sharp Eyes Test! Divide the students into two lines facing each other; make sure each student has a partner.

Read

"Look very carefully at the person facing you. Pay attention to details such as buttons, shoe laces, jewelry, etc. When I give the signal (make up a signal such as clapping your hands), turn your back to each other and change one thing about the way you look. You could unbutton a button, take off your glasses, roll up your sleeves, or make another small change. When I give the signal again, turn around, face your partner, and try to figure out what changes your partner made."

Do

- Allow about one minute for students to observe each other.
- Give the signal and allow time for the students to make changes.
- Give the second signal and allow time for the students to figure out what changes the other person has made.
- Have each pair of students share the changes they observed about each other.
- Repeat the activity until everyone has gained their Sharp Eyes!
- Have the students return to their seats and hold a discussion about sensing nature.

Ask

"What sense were you using during Sharp Eyes?"

(Sight. We use our eyes to see the world around us.)

Do

Hold up a flower and ask the students how they could learn more about it. Elicit responses such as seeing, smelling and touching, and pass the flower around.

Read

"Taste is another sense, but never taste plants unless an adult you trust says it is okay. There are many poisonous plants."

Do

Distribute napkins and small pieces of fruit to each student. Ask the students to look, smell, touch, and finally taste each piece of fruit.

Part 2: Sensing Nature (30 min)

Ask

"How can we use our senses to learn about nature?"

(We can look at plants, rocks, animals; we can touch leaves, mud, water; we can smell flowers, skunks; we can listen to birds, mammals, the wind, rustling leaves; we can even taste some plants, but *never* taste a plant unless an adult says it is okay – there are many poisonous plants.)

Read

"We are going to go into the schoolyard and use our senses to observe nature."

Ask

"How should we behave outside?"

(Discuss rules for behavior with the students.)

Do

Take the students outside and sit in a comfortable grassy area.

Read

"The first sense we will concentrate on is hearing. Close your eyes and sit quietly until I tell you to open your eyes. Concentrate on listening. Count the number of different sounds you hear."

Ask

"What did you hear?"

"Which things were natural and which were not?"

"Which sounds did you like the most?"

"Which did you dislike the most?"

Do

Take a sensory walk around the area to discover other sights, sounds, smells and textures. Pick up objects and use as many senses as possible to observe each object. (Do not pick up human-made objects that can cause injury, transfer disease, etc.) Smell a plant, feel a rock, look at an insect. *Do not taste any plants* – there are many poisonous plants! Remind the students to place any natural objects they pick up back where they found them.

Extension: Calling All Birds

(Grades 3–6)

Adapted from "Sound Off," Outdoor Biology Instructional Strategies, Lawrence Hall of Science, and "Calling All Birds," Salt Marsh Manual

Ask

"Why do birds sing or call?"

(To attract mates, to alarm others about danger, to establish territory, and just to sing.)

"How do birds find a mate of the same species?"

(Birds identify each other through their songs. A keen sense of hearing is critical for the survival of their species because if they cannot find a mate, no young birds are produced to replace the old birds that die or are eaten by predators.)

Do

Pass out pairs of opaque film containers (each pair should be filled with something different). Pass out one film container to each student.

Read

"The sound that the canister makes is your song and you need to find another bird with the same song by shaking the canister. When you think that you have found your partner, stand together. When time is called, open your canisters to see if you found your partner."

Do

Once everyone has found their partners, collect the canisters and pass them out again; decrease the amount of time they have to find a partner. You can play several rounds making each one shorter as the students improve at differentiating the sounds. At the end of the activity, collect the canisters and discuss the questions below.

Ask

"What problems did you experience while trying to find your partners?"

(Some answers may include: too much noise or not enough time.)

"Do birds have the same problems?"

(If there is noise that sounds similar to their call, the birds may have trouble finding a mate.)

"How do unnatural sounds affect bird calls?"

(They have to adapt to the interfering sounds or move to a different area.)

Habitats & Food Chains

Overview

This activity introduces students to habitats and food chains.

Duration

Three 30 minute sessions

Grades

K-6

Key Concepts

A habitat provides what living things need to survive: food, water, shelter and space. Food chains show the way living things depend on each other for food.

Objectives

Students will be able to:

- define "habitat" and describe the habitats of various plants and animals (schoolyard plants and animals, humans and wetland plants and animals)
- define "food chain" and describe a wetland food chain

Materials

Part 1: What is Your Habitat?

- crayons, markers, colored pencils
- paper

Part 2: A Schoolyard Habitat

- paper
- pencils
- clipboard or folder

Part 3: Habitats on the Refuge

- grades 3-6: copies of pgs. 50 and 51 (one per 2 to 4 students)
- grades K-2: large sheet of paper for mural, and enlarged copies of pg. 50

Part 4: Food Chain Links

- construction paper
- scissors
- glue or staplers/staples
- crayons, markers or colored pencils
- sample food chain (make beforehand)

Essential Academic Learning

Requirements

Parts 1 and 2: Communication 3.1, 3.2, 3.3; Science 1.1, 1.2, 2.1; Art 1.1, 1.2, 1.3, 2.1, 4.1

Parts 3 and 4: Science 1.2, 1.3, 2.1, 3.1; Art 1.1, 1.2, 1.3, 2.2, 4.1

Background

- A habitat provides a living thing with everything it needs to survive. Living things require different types and amounts of food, water, shelter and space. Living things can only grow in suitable habitats that supply all of their needs. For example, a *Mallard* would be in a *wetland* habitat and would include places to find food, a sheltered place in *tall grasses* and *cattails* to build a nest and space to find a mate.
- Food chains demonstrate how living things depend on each other for food (energy).
- All food chains begin with producers, usually plants. Plants produce their own food (energy) by using sunlight. Through photosynthesis, plants absorb energy from sunlight and convert carbon dioxide and water to food in the form of sugars, releasing oxygen as a by-product.
- Animals are consumers, they cannot produce their own food. Animals that eat plants are known as herbivores and are the first level consumers in a food chain. Animals that form the second, third, fourth, etc. level consumers in the food chain are carnivores (flesh-eating), insectivores (insect-eating), or omnivores (flesh- and plant-eating).
- A *grassland* example of a food chain: grass, deer mouse, Northern harrier. Food webs represent the interconnections of many food chains and the fact that animals eat a variety of food.

Part 1: What is Your Habitat?

Do

Go over what a habitat is (a place where a plant or animal lives/ their home) and what all plants and animals need in their habitat (food, water, shelter and space). Have students describe a habitat for an animal. Ask students to draw and describe their habitats and draw or list what they need to survive. Afterwards, discuss how their habitats are different from and similar to the habitat of a wild animal or plant. Compile a list of all the students' needs. Go over the list with students and cross off needs determined not to be necessary for survival.

Have students discuss where their needs come from. For example, "Where does their food come from originally?"

Part 2: A Schoolyard Habitat

Do

Investigate habitats in the schoolyard. Before going outside, discuss rules for behavior with the students, such as how they can show respect for a plant or animal and how they should treat plants, animals and their habitats.

Read

"You will be observing a plant or an animal in the schoolyard and investigating what the plant or animal needs to survive. Everything a plant or animal needs to survive is in it's habitat."

Ask

"Where do you think would be good places to find a plant or animal in the schoolyard?"

(Areas under rocks; cracks in the pavement; area along fence lines; places in and under trees, bushes and grass; areas along buildings.)

Do

Divide the students into pairs. Each pair needs paper, pencils and a clipboard or folder. Walk outside with the students and instruct them to locate a plant or animal and to draw or describe it. They need to answer the questions (either in written form or in a drawing):

"Where does the plant or animal find food, water, shelter and space?"

"What is the plant or animal's habitat?"

Assist the students with locating living things. Allow 10 to 15 minutes for the students to work on the drawings and/or descriptions and then return to the classroom. Back in the classroom, ask each pair to share their drawing or description of the plant or animal they chose and its habitat.

Alternate Option

Another option is to have students choose an animal to study, or make-up a predator or animal in the classroom. What does it eat? How does it live? What are its requirements for survival? Then, have students look for water, food, shelter and space in the schoolyard for their particular animal. Again, use the opportunity to discuss rules for behavior and showing respect for animals.

Part 3: Habitats on the Refuge

Do

Review with students what animals and plants need to survive. Write the four components of a habitat on the board; food, water, shelter and space.

Read

"We are going to visit Nisqually National Wildlife Refuge on our field trip. The Refuge provides several habitats for many different plants and animals."

Do

Grades 3-6

Hand out copies of habitat drawing and of the drawings of Refuge plants and animals to each group of 2 to 4 students. Direct the students to cut out the plants or animals and add them to the drawing. For each plant and animal, the students need to locate what it needs to survive and draw lines from the plant or animal to what it needs (see list below for ideas). Choose one of the plant or animals from the list to use as an example with the whole class, if necessary.

Grades K-2

On a large sheet of paper draw an area (or enlarge the habitat sheet) that includes water, mud flats, grassland and trees and label the areas Estuary, Grassland and River. Enlarge the drawing

of Refuge plants and animals. Cut out the plants and animals and give one or two to each student. Place the habitat drawing on the wall and have students place the plants and animals on the drawing. As a group, color the mural. Assign each student or group of students to locate what their plant or animal needs to survive and draw lines from their plant or animal to the things it needs (see list below for ideas). Choose one of the plants or animals from the list to use as an example.

Northern Harrier needs: mice and other small animals to eat, trees or poles on which to perch and nest, space to fly, air to breathe.

Deer Mice needs: grasses, sedges and seeds to eat, bushes and grasses to hide and rest, space to search for food and build a nest, air to breathe.

Grasses/Sedges needs: sunlight to produce food, water from rain, the river or ponds, soil to grow in, space to grow, air to breathe.

Bald Eagle needs: tall trees to perch and nest in, salmon and small rodents to eat, water to drink, air to fly in, air to breathe.

Salmon needs: other small fish and insects to eat, water to live in and lay eggs in, space to find food and swim, oxygen in the water to breathe.

Peregrine Falcon needs: birds (such as thrushes, swallows or Western sandpipers) to feed on, space to fly, air to breathe, trees or cliffs to nest in or on.

Western Sandpiper needs: insects and worms to eat, shrubs near marine water to nest in, space to fly in, air to breathe.

Great Blue Heron needs: frogs, small fish and clams for food, water to fish in, space to feed and shrubs to nest in, air to breathe.

Red-legged Frog needs: small insects for food, fresh water to live and lay eggs in, space to feed and rest, air to breathe.

Small Insects need: phytoplankton for food, mud, soil or trees to live and nest in, space to find food, air to breathe.

Phytoplankton (small, drifting plants) need: sunlight to produce food, water from the Sound to live in.

Part 4: Food Chain Links

Do

Refer to the students' habitat drawings to introduce food chains. Go over how plants get their food (from the sun); animals that feed on plants (first level consumers); animals that feed on the first level consumers (second level consumers); and animals that have nothing preying upon them (top level consumers). Ask students to define a food chain (A food chain shows the order in which plants and animals feed on each other) and give an example of one food chain in the habitat drawing.

Hand out construction paper, scissors, glue, and markers, colored pencils, or crayons. Show the sample food chain you made before class. For students too young to use scissors, cut the construction paper into strips beforehand.

Grades 3-6

Have students choose a food chain from the drawing they would like to make. Remember it must start with a producer.

Grades K-2

Have students make the following food chain: grasses -> deer mouse -> Northern harrier

To create the food chain, cut construction paper into strips about two inches wide and eight inches long. Draw one member of your food chain on each strip of paper. Loop the construction paper into a chain that shows the order of the food chain.

Habitats & Food Chains Activity Sheet

Refuge Animals



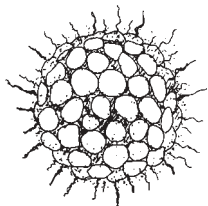
Deer Mouse



Fly



Grasses/Sedges



Phytoplankton



Great Blue Heron



Frog



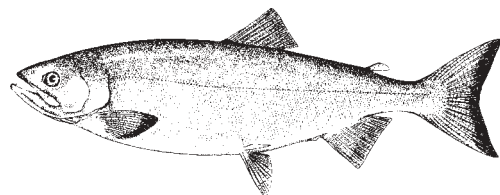
Bald Eagle



Western Sandpiper



Northern Harrier



Salmon



Peregrine Falcon

Habitats & Food Chains Activity Sheet

Refuge Habitats



Trace Your Trash

Overview

Students separate their lunch garbage for recycling and determine what natural resources are in their lunch.

Grades

K-6

Key Concepts

Every product or package associated with lunch came from a natural resource. By practicing the 3R's (reducing, reusing and recycling) you can decrease your consumption of natural resources and reduce the amount of garbage that goes to landfills.

Objectives

Students will be able to:

- divide their lunch garbage into appropriate categories for recycling.
- name the natural resources that waste is made from.

Materials

- 7 lunch buckets
- 7 lunch bucket labels: rinse, extra drink, glass, aluminum, food, paper, plastic

Essential Academic

Learning Requirements

Science 1.3, 3.2; Geography 2.2, 3.1, 3.2, 3.3

Recommended Time

Lunch (15-20 min)

Separate Trash (5 min)

- students separate their lunch trash into buckets labeled glass, aluminum, food, paper and plastic

Discussion (5 min)

- lead a discussion about what natural resources were used to make their lunch and how to reduce the amount of waste they produce.

Concepts

What are the Refuge's resources?

- Significant wildlife habitat, endangered species and migratory birds.

What makes it necessary to manage the resources?

- Loss of habitat for endangered species and migratory birds, due to development such as landfills.

What can students do to help?

Refuge staff acquire and preserve wetland habitat, but we need your help.

- Reduce, reuse and recycle, decreasing the need for landfills and teach others the same.
- Pack out your trash when visiting the Refuge - there are limited facilities to handle trash.

Background

- The products and packaging associated with lunch were produced from natural resources.
- Glass is produced from sand and paper bags come from trees.
- Resources can be classified as renewable or nonrenewable.
- Renewable resources can be replaced. Trees cut down for paper products are replanted over and over again.
- Nonrenewable resources are available in limited quantities, such as oil. Once they are used up, they cannot be replaced.
- The United States is currently the highest consumer of nonrenewable resources.
- At the current rate of consumption of nonrenewable resources, global supplies of many resources, such as oil, aluminum, lead, tin and natural gas, may be depleted within the next 100 years.
- Common products found in lunches and the resources they were produced from are listed below. Along with consuming natural resources, discarded products and packaging end up in landfills.

<u>Waste Material</u>	<u>Natural Resource</u>	<u>Renewable?</u>
Paper	Trees	Yes
Glass	Sand, Lime, Soda	No
Aluminum	Bauxite	No
Plastic	Oil	No
Food	Plants or Animals	Yes

- Historically, landfills were built on wetlands and other important wildlife habitats. Loss of habitat to many forms of development, including landfills, is a major threat to wildlife.

- The average person in the U.S. generates 3-4 pounds of garbage every day and each student produces about a half pound of waste per school day.
- Individuals can make a difference in extending the life of natural resources. Consumers can:
 - 1) Reduce their consumption of natural resources,
 - 2) Recycle the products they do purchase,
 - 3) Purchase recycled products versus products made from original natural resources (virgin materials).
- Practicing the 3 R's (reducing, reusing and recycling) reduces the amount of garbage you produce, reduces the need for landfills and saves natural resources and energy.

Separate Lunch Trash (5 min)

Do

After students finish eating their lunches, have them separate their waste materials into the appropriate bins: food, glass, aluminum, paper and plastic.

Discussion (5 min)

Ask

"Did anyone have a tree in their lunch?"

(Paper products are made from trees.)

"Did anyone have plankton in their lunch?"

(The remains of aquatic microorganisms were buried deep under ground for thousands of years until these remains became oil. We now use oil to make plastic products.)

"What are natural resources?"

(Resources that come from the environment.)

"Every product or package is made from a natural resource. What are alternatives to using natural resources?"

(Reducing, reusing and recycling.)

"Where does garbage go if we don't recycle?"

(Garbage goes to landfills. Landfills were historically built on top of wetlands. The Nisqually Refuge was once proposed to become a landfill. The less garbage we create, the less of a need there is for new landfills.)

Do

Stand by the lunch container that is holding the product you are describing. Hold up a product, such as an aluminum can, as you talk about it.

Ask

"Aluminum comes from bauxite, a mineral that has to be mined from the Earth. How do we use aluminum in our lunch and what are some ways to reduce the need for mining bauxite?"

(We use aluminum in cans and in aluminum foil. We could use reusable containers to carry our lunch or our sandwich and we can recycle aluminum.)

"Where does the paper used to make our lunch bags come from?"

(Paper comes from trees that are logged.)

"How can we reduce our need for paper in our lunches?"

(We could reduce the need for logging by packing our lunches in lunch boxes, reusing bags, and recycling the paper we do use.)

"Plastic, such as a plastic sandwich bag, is made from oil. How could we reduce the use of plastic in our lunch?"

(Using reusable containers, such as Tupperware.)

"Glass is made mainly from sand. How could we reduce the need for new glass?"

(Using reusable containers for our drinks and by recycling the glass we do use.)

"Where does food come from?"

(Food comes from farms.)

"How can we reduce the amount of food that goes to landfills?"

(We can compost our leftovers, creating rich soil for our gardens.)

"How does reducing, reusing and recycling help the Refuge?"

(By reducing the need for landfills around the Puget Sound, you can help protect habitats and the plants and animals that depend upon those habitats.)

How to Pack a No-Trash Lunch

Overview

In this activity, students prepare for packing a no-trash lunch on their field trip by discussing ways to pack a no-trash lunch and conducting a no-trash lunch day at school.

Duration

20 minute discussion and one lunch period

Grade

2-6

Key Concepts

Important habitats, such as wetlands, have been historically filled in for many purposes, including landfills. By reducing, reusing and recycling, we can reduce the need for landfills around the Puget Sound.

Objectives

Students will be able to:

- state the importance of recycling and waste reduction
- describe ways to produce almost no garbage with their lunch by reducing, reusing and recycling
- pack a no-trash lunch for the field trip

Essential Academic Learning Requirements

Geography 3.1, 3.2; Science 1.1, 2.2, 3.2; Communication 3.3

Adapted from "The Great No-Trash Experiment," Salt Marsh Manual

Background

- Direct connections can be drawn between the way we live and how our actions impact the habitats, plants and animals around Puget Sound.
- There is a connection between how much waste is produced and how few wetland and other wildlife habitats remain around the Sound. Many of these areas have been filled in for landfills for our garbage, or for development. Over 75% of wetlands in the Puget Sound have been destroyed by dredging, filling or development.
- Due to demands created by a growing population, there are continued pressures to develop what remains.

Ask

"Can someone tell me what a natural resource is?"

(A resource that comes from the environment that is either renewable such as trees or nonrenewable such as oil. Some natural resources, such as oil, cannot be replace once we use them up. Others such as trees, take many years to replace.)

"Who can tell me why garbage is considered 'valuable'?"

(Everything we throw away is made using natural resources that can't be used again if buried in the ground. New products will have to be made from "new" natural resources. If we reduce, reuse, or recycle, we are protecting natural resources.)

"Where does garbage go when it is thrown away and how does this affect the environment?"

(Garbage goes to landfills, which are sometimes built on wildlife habitat. Historically, wetlands around the Sound were used as landfill sites.)

"On our field trip on (date of field trip) we will try to pack No-Trash lunches. By using reusable and recyclable containers, we will not throw anything into the garbage except leftover food. Why is it important that we try to produce no garbage on our Nisqually National Wildlife Refuge field trip?"

(By having no trash in our lunches, we know that no garbage will be left behind after our field trip. Also, in the past many wetlands and wildlife habitats were turned into landfills. The less garbage we produce, the less need there is for landfills and more habitat can be saved for wildlife.)

Read

"In order to not produce garbage during our field trip, we need to think of some ways to carry our lunches that do not need throwaway containers."

Ask

"What are some ways you can think of?"
(Cloth lunch bags, lunch buckets or boxes, reusable plastic sandwich boxes, refillable juice containers, food that does not need wrapping such as fruit or vegetables, reusable ziplock bags, old yogurt containers, etc. You can also use containers that can be recycled.)

"What items can easily be recycled?"
(Glass, aluminum, plastic #1 and # 2, newspaper - these may vary depending on where you live. At the Refuge, recyclable items can be separated from garbage and taken back to school.)

Read

"We will write down all of these great ideas for packing a no-trash lunch so we can take them home to put up in our kitchens. That way, we will be reminded of different ways that we can carry our lunch that produce little or no garbage."

Do

Have class write all of the brainstormed ideas either individually or you write them on one page to photocopy for the whole class.

Read

"On (day of no-trash lunch experiment), we will pretend we are on a field trip to the refuge. Only glass and aluminum will be recycled. Anything else not reused will be thrown away and go to a landfill. We need to pack lunches that will produce no garbage. That means reducing, reusing and recycling, the 3 R's."

Do

On the day of the No-Trash Lunch Experiment, set out recycling bins for glass and aluminum. If there is any garbage, lead a discussion about alternatives for particular items.

Where the River Meets the Sound



Education Center

Education Center Activities

Cycles of Nature

Food Chain

Why the Tides Ebb and Flow

Habitat and Wildlife

Invertebrate Pictionary

What Am I Hungry For?

Birds and Migration

Bird Mapping

What Can I Eat With This Beak?

Endangered Species

The Web of Life

Earth Stewardship

All Things Seaward

Cultural History of the Nisqually Watershed

From Marsh to Metropolis

Plants and People

"Man did not weave the web of life; he is merely a strand in it. Whatever he does to the web; he does to himself."

— Chief Seattle

Where the River Meets the Sound



Education Center

The Education Center has six theme rooms, a discovery lab and library, a main room, restrooms, and access to the Refuge trails.

Theme Rooms

The theme rooms have exhibits and hands-on activities for grades 3-7. The activities are included in this guide and the instructions are also in the rooms. Activities are designed to be led by an adult leader and take about 10 minutes.

One option is to break your class into six groups of 4-7 students and rotate through the rooms, doing an activity in each. Teachers should assign groups prior to arriving. Set aside at least an hour to do activities this way. You may also choose a few focused activities or themes depending on the class curriculum and focus of study.

Birds & Migration

This room contains mounted birds, nests and eggs, most behind glass. Mounts should not be touched - oils from hands attract mites. The bird mapping activity explores how scientists band birds to understand more about migration.

Cycles of Nature

The salmon life cycle is described with visual exhibits - eggs developing into fry, a water cycle and food chain activity, and tracks, skulls and owl pellets.

Earth Stewardship

Refuge habitats and watershed concepts are emphasized. An exhibit shows habitats changing over time. The activity demonstrates how polluted run-off effects everything downstream.

Cultural History of the Nisqually Watershed

A wall mural depicting a timeline of the Delta. Students identify common plants and learn about their historical use. Another activity helps students understand landscapes change over time.

Habitat & Wildlife

An aquarium with freshwater pond life is the feature. There is also a bug collection. The main activity, "Invertebrate Pictionary," helps students describe and draw an invertebrate.

Endangered Species

Endangered species exhibits include a bald eagle and peregrine falcon, and a gray whale skull. Using pictures and string, the web of life activity has students connected in a food web.

Discovery Library & Lab

Two microscopes are focused and ready with interesting slides. The room is also available to teachers as a resource room with books, videos and other materials to checkout.

Main Room

The main room can be used for opening and closing sessions for groups up to 40. Tables, chairs and a chalkboard are available. The "What Can I Eat with This Beak" activity can be set up here.

Food Chain

Cycles of Nature Room

Overview

Students arrange plants and animals according to what they eat, then deconstruct the web of life in a domino-effect scenario.

Duration

30 minutes

Grades

4-8

Subjects

Science

Objectives

Students will:

- classify animals according to what they eat.
- identify the vital role of green plants as producers in the food chain.
- trace ecological catastrophe through the food chain to understand the interdependence of all living things.

Materials

- directions
- Web-of-Life chart
- magnates

Vocabulary

Photosynthesis, Food Chain, Producer, Consumer, Herbivore, Carnivore, Omnivore, Decomposer

Essential Academic Learning Requirements

Science 1.2, 1.3

Background

Ask

"Have you ever heard the term: 'You are what you eat?' If this is true, what are you?"

(When you eat a turkey or a cow or a fish, you also eat what is inside that animal. Cows like to eat lots of grass. Turkeys like to eat lots of grains. Fish like to eat seaweed and algae. Unless you only eat rocks, you will have plants – or the energy from plants – in your body.)

Read

Green Plants

"What do plants eat? It depends what kind of plant. Most plants are green. Green plants are special because they do not digest other plants or animals. Green plants have the power to photosynthesize, to produce their own food. What does this mean? Is it like growing a garden or baking a cake? No. Producing your own food the way plants do is drawing elements like sunlight, air and water into your body, and turning them into sugar. Plants use sugar to help their bodies grow. People use sugar too. But we have to eat a plant to get the sugar."

Read

Food Chain

"Living things on earth share energy by eating each other. It's true! Look at the chart on the wall. In the very center is the sun. We all need the sun, as we need water, air and minerals too. Coming out from the sun are green plants, producers. The yellow circles of light connect all the animals, the consumers. Animals are consumers because we consume, or eat, other living things. This gives us the energy to grow, to run and to jump, to raise children. Animals that consume only plants are called herbivores. Animals that consume animals are called carnivores ("carni" means "meat"). Animals that consume both plants and meat are called omnivores."

Ask

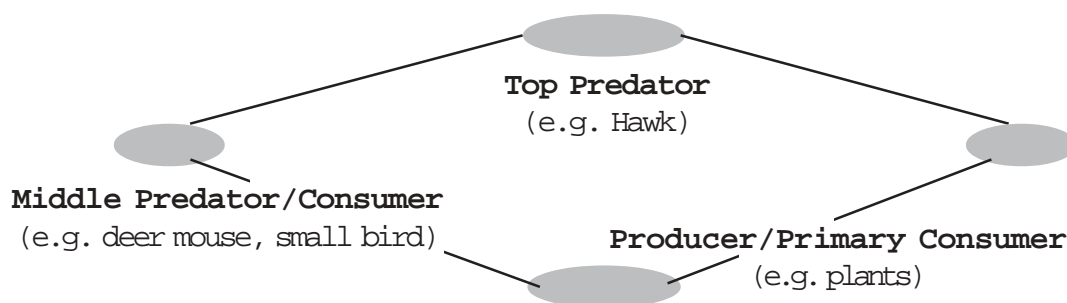
"Which one are you?"

Read

"There is one last kind of consumer on the food chain – the decomposer. Decomposers like fungi and bacteria eat already dead plant and animal bodies. Mushrooms grow on fallen logs. People sometimes eat mushrooms. So the energy from dead trees feeds both mushrooms and people. In this way, trees are given new life. That's the way the food chain works. What you eat determines your place on the food chain?"

Directions

1) The object of this activity is to arrange animals and plants according to who eats who. The animals and plants go on the purple dots. Pick a purple dot on the outside edge of the picture. Place one of the top predators (large animals), either the Great Blue Heron, the Coyote, the Northern Harrier, the Eagle, the Human, or the Mink – on this outside dot. Now do you see how it is connected to two other purple dots by curvy lines? Place two small animals on these two middle dots. What you must pretend is that the large animal on the outside dot eats both of the animals on the two middle dots. Also, each of the animals on the middle dots eats two other organisms.



2) Arrange the plants and animals by what eats what. Start with the big animals on the outside dots, and work your way in. There is a clue sheet, but try not to look at it until you find your own solution.

3) Is every living thing in its proper place? Now what happens if you take one away? In our world, entire species of organisms go extinct by the minute. This means they just disappear from the face of the earth, the way the dinosaurs did. When a species disappears, it effects the entire ecosystem. Try it yourself!

Pretend the river has been polluted by toxic chemicals. Ask, *"Which animals will be affected?"* (Some animals will die. Some animals will move away. Some animals will adapt. But all of the animals will be affected.)

There are some important principles to understand. Say the fish start dying. What do the eagles eat? They probably have to eat more of something else, like more baby ducks. Now what happens to the ducks? Either they have to adapt, such as find a better way to hide from the eagles, or they have to move away. Otherwise, their population will slowly die out.

4) Start with one animal. Does this species die, adapt, or move away? If it adapts, how? How does this effect the animals around it? If it dies or moves away, remove it from the board. Now there is a hole in the food chain. How does this affect the other animals? Tell the story for each animal one by one. Players can take turns. Don't stop until you can think of no more effects from the poison in the water.

Why the Tide Ebbs and Flows

Cycles of
Nature Room

Overview

Students enact a creation myth, exploring scientific and mythical explanations for ocean tides.

Duration

Part One – 30 minutes

Part Two – 20 minutes

Part Three – 45 minutes

Grades

1-6

Subjects

Cultural Studies,
Science, Communication

Objectives

Students will:

- form a personal hypothesis about why there are tides.
- explore the dependence of people and animals upon the tidal flux.
- compare and contrast scientific and mythological explanations for natural phenomena.
- analyze the importance of both scientific inquiry and mythological traditions.
- appreciate and practice oral tradition.

Materials

- narrator's script
- two rocks
- black paper or plastic cut to represent a black hole
- costumes: cloaks or masks for a raven, a starving person, sea creatures... be creative!

Essential Academic

Learning Requirements

Communication 2.3, 3.2

Directions

Read

"Have you ever been down to the beach when the water is just a thin line on the horizon? Have you ever been to the beach when the water is so high you can't walk on the rocks without getting wet?"

Ask

"What do we call this movement of ocean water?"

(The tide, which rises and falls, or ebbs and flows, twice a day.)

"What causes the ebb and flow of tides?"

(Just think about it – don't provide any answers yet.)

Read

"All estuaries are influenced by tides, and tides are a vital part of an estuary habitat. High and low tides mix fresh water from the river and salt water from the sea, passing nutrients throughout the entire ecosystem.

Animals who live in a tidal environment depend upon the highs and lows for their daily survival. Some animals feed when the tide is high, like the Caspian tern diving for fish. Other animals feed when the tide is low, like the blue heron wading in water to catch small fish and crustaceans.

People make use of both high and low tide, fishing when the water is in and gathering shellfish when it is out. The native peoples of the Pacific Northwest coast have a saying: "when the tide is out, the table is set". Just like the animals, those of us who subsist off of the beaches of the Puget Sound rely upon the tides in our daily habits.

There are many reasons why the tides go in and out. The Tahtlan Indians of British Columbia tell stories about why the tide is sometimes high and sometimes low. We can all act out their story, to learn how they have explained tides. Then, we can listen to the scientific reasons for the ebbing and the flowing of tides.

This is an ancient story, passed down from parent to child, from grandparent to grandchild. The Tahtlan Indians kept their stories alive by telling them. They never wrote them down, so they had to remember them."

*A Skit Based Upon a Tahtlan Native
British Columbian Legend*

Part 1: Why the Tides Ebb and Flow: A Tribal Perspective

from "How the People Sang the Mountains Up" by Maria Leach, ©1967

Directions

Read the script aloud. Allow students to improvise enacting the events. You can assign parts ahead of time or simply call on volunteers as the characters enter the story.

There are at least five parts. If you need more, add starving people and/or sea life.

Characters

- Narrator/Director (Teacher or Group Leader)
- Starving Person/People
- Raven
- Sea Life, including Fish, Mussels, Clams, Starfish and Crabs (these can be played by one person if need be)
- Great Big Man

Props

- Two rocks (Raven will hold the 2 rocks)
- One black circle cut-out (Great Big Man will sit on the black circle cut-out that represents a hole in the earth)

Story

(Stage suggestions are in italics. Students are to listen carefully to the story so they can act out their characters.)

This happened long ago when the people were learning how to live in the world. The people had no food. They were starving.

(STARVING PEOPLE act hungry – groan for food – hold your bellies)

One day when Raven was out on the ocean in his canoe...

(RAVEN row your canoe)

...following along the shores and beaches, he saw fish swimming under water.

(FISH swim around)

He saw crabs crawling.....

(CRAB crawl)

...mussels lying in their beds....

(MUSSEL lie on the ground)

....little clams sticking their necks out...

(CLAM stick your neck out)

....starfish rambled around in their strange circular advance.

(STARFISH squirm around and around)

"The people could eat these things if they could get them," said Raven. Raven, culture hero of all Northwest Pacific Coast peoples, was fixed upon the world and was teaching people how to live. He thought all people should have enough to eat. He was the one who fixed the earth so it would not tip. He put a big piece of ice across the north of it, and since then it has not tipped. Raven fixed the world and taught the people everything. 'The people could eat these things if they could get them', he kept thinking, but the water was too deep. Raven paddled along....

(RAVEN continue to paddle your canoe)

...paddled along, wondering what to do. Then he saw a great big man sitting on the shore.

(GREAT BIG MAN sit quietly on the ground on top of the black circle.)

(RAVEN, squint into the distance and look at the great big man.)

'What are you doing there?' said Raven. 'Sitting,' said the man. 'Why?' asked Raven. 'If I get up the ocean will go dry,' said the man. 'So I sit.' The man was sitting on a hole in the earth. If he got up, the ocean poured into the hole. 'Get up and let me look,' said Raven. 'No,' said the man.

(GREAT BIG MAN act angry and shake your head no)

He would not budge. So Raven grabbed him by the hair and pulled him up.

(RAVEN pull the man up gently)

Sure enough there was a bottomless hole in the earth, and when the man stood up, the ocean waters poured and roared into it. Raven slid a sharp stone alongside the hole with his foot.

(RAVEN slide one stone over the hole)

When the man sat down, the stone jabbed him and he jumped up.

(GREAT BIG MAN sit on the stone and then jump up in pain)

Raven slipped another sharp-pointed stone under him, so that when the man sat, it hurt worse.

(RAVEN slide the other stone alongside the hole)

The man leaped into the air again.

(GREAT BIG MAN leap into the air again)

While this was going on, the waters poured into the hole; the ocean receded, and the beach was uncovered. Yes, The people can get food here, Raven decided. 'From now on,' said Raven to the man, 'you must stand up twice everyday, long enough to let the waters recede as far as they are now, so that the people may find food.' 'All right.' said the man. 'All right.'

(RAVEN and the GREAT BIG MAN shake hands.)

Thus it is that the tides began to ebb and flow and the people gathered seafood on the shores.

(STARVING PEOPLE rush to the sea animals and pretend to gather them and bring them back to your village.)

Part 2: Why the Tides Ebb and Flow: The Scientific Story

Directions

Please read this ahead of time and paraphrase for your audience, however they will best understand.

Gravity

In order to understand tides you must understand something called *gravity*. Gravity is the reason why things thrown up in the air come back down to the earth. The earth pulls things to it, similar to a magnet. All things in space are attracted to one another other by gravitational pulls. The bigger the object, the more it pulls on things near it.

Tides

Tides are caused by the gravitational pull of the moon and the sun. In other words, the moon and the sun are both big enough to tug on things on earth. The moon's pull is almost twice as strong as the sun's, because it is closer to the earth. Since water is so flexible, it is easy to see water pulled towards the moon. Ocean water collects on the side of the earth closest to the moon, creating in that place a very high tide, or what is called a *flow* tide. When there is a high tide on one part of the earth, there has to be a very low tide elsewhere. Very low tides are called *ebb* tides. Does the low tide always happen on the part of the earth that is farthest away from the moon? You would think so, but this is not the case, and I'll tell you why.

Centrifugal Force

When there is a high tide, water also collects on the opposite side of the earth. This happens because of something called centrifugal force. Centrifugal force happens because the earth and moon are spinning around each other in a circle. Imagine two people holding onto both of each other's hands and spinning together. Can you see their long hair flinging outward? Now imagine a merry-go-round. Did you ever get a merry go round spinning really fast, and did you ever feel yourself being pulled outward? Now imagine a person in a billowy skirt spinning around and around. The skirt billows outward, doesn't it? Well, water acts just like long hair, just like your body on a merry go round, and just like a spinning skirt. Remember that not only is the moon pulling on the earth, but it is also spinning around and around the earth.

Ask

"What explains extreme high and low tides?"

(When the sun, the moon, and the earth are all lined up, the gravitational pull is even greater and will cause the extreme high and low tides. This happens two times a month - during the full moon and the new moon.)

Tidal Cycles

Two high tides and two low tides occur every 24 hours and fifty minutes in Olympia. Every twenty-four hours, the earth spins all the way around once. In the meantime, the moon has been spinning around the sun and it is in a different place. Earth has to catch up to the moon, and this takes another fifty minutes.

The tides are different sizes in the same day. This is because the earth spins on a tilted axis around the sun. It wobbles. So, the beach that you stand on at 12 noon will be positioned differently at 12 midnight relative to the sun.

Part 3: Questions for Discussion

- 1) Why is it important to know the scientific evidence for things that happen in nature?
- 2) Why is it important to tell the legendary and mythical reasons for things that happen in nature?
- 3) Students: please make up your own short story, explaining why the tides ebb and flow. When everyone is ready, we'll form a circle and tell our stories one at a time. Try not to write anything down. Keep as much as you can in your head, as oral storytellers do.

Invertebrate Pictionary

Habitat & Wildlife
Room

Overview

A pictionary game about marine invertebrates. By describing and drawing fantastic creatures based on actual animal characteristics, students learn the role adaptation plays in the great diversity of life on earth.

Duration

20-30 minutes

Grade Level

3-8

Subjects

Science, Art

Objectives

Students will:

- differentiate between vertebrates and invertebrates.
- give examples of physical and behavioral animal adaptations.
- describe physical characteristics of marine invertebrates.
- draw unidentified creatures based on physical descriptions.
- match descriptions and drawings to creatures they are familiar with.
- understand that as a rule, physical and behavioral animal characteristics are shaped by survival conditions.

Materials

- background and directions
- species descriptions
- whiteboard and markers

Vocabulary

Invertebrate

Essential Academic

Learning Requirements

Science 1.1; Art 4.1

Background

Read

"Did you know that humans are a very unusual type of animal? One of the reasons we are unusual is because we have a backbone. Only three percent of all animals living on earth have an internal spine! 97% either have shells on the outside of their body, like spiders, oysters and lobsters – or they are completely soft bodied, like jellyfish. Animals without skeletons on the inside are called invertebrates."

Ask

"Can you think of some invertebrates?"

Read

"One of the most interesting places to observe invertebrates is at the beach. Invertebrates at the beach look less human than just about any other living creature. They do things like attaching their heads to rocks, (sea squirts), and turning their stomachs inside out (starfish)."

Ask

"Why are they so different from us?"

(Because they have to survive in completely different conditions! If you lived in the water and you didn't want to get carried away by the tide, you would attach yourself to a rock, too. The sea star eats clams. It does not have a knife to pry clams out of their shells. So instead, it sends its stomach into the clam shell, digests the clam with stomach acids, slurps up the good stuff, and returns its stomach to its body. This way of eating works for starfish, though it wouldn't work for humans.)

Directions

Be familiar with the directions before you start!

1) There are pictures of marine invertebrates in a folder on the shelf. Each picture is tied to a description that belongs to that picture and no other. The group leader passes out a picture with the corresponding description to each player. Players must not show their picture to other players.

2) Players, find a partner. Partners stand at the whiteboard two at a time. When it is your turn, bring your picture and description with you to the whiteboard – but don't let anybody see. One of you is the reader and one is the artist.

Reader: Start by reading the description you were given. You may read the description twice if you want. Then write down three descriptive things about your invertebrate on the whiteboard. Do not copy the description you already read. Try to come up with extra details. Is your animal soft or hard? How many legs does it have? What do the eyes look like? Is it spotted? Is it hairy? What is it attached to? Does it have patterns on its skin or shell? Don't use colors because that will not be helpful to the artist.

Artist: Try to draw what is being described. Don't worry about it being realistic. If it doesn't make sense, just make it up! Use your imagination!

3) Is the artist done? Who can guess what the animal is supposed to be? Reader, show your picture to the group. Now switch roles. If you drew first, now you read about your animal. If you read first, it is your turn to draw your partner's animal.

4) Repeat steps 2 and 3 for each pair.

5) When you are finished, please return the picture and descriptions to the folder as you found them for the next group.

What Am I Hungry For?

*Habitat & Wildlife
Room*

Overview

By matching predator to prey and prey to predator, students gain understanding of how plants and animals are interdependent.

Duration

25 minutes

Grade Levels

K-5

Subject

Science

Objectives

Students will:

- track the process of energy through the food chain.
- differentiate between producer and consumer, carnivore, herbivore and omnivore.
- illustrate the relationship between predator and prey.

Materials

- copies of worksheets for the whole class
- crayons, markers or colored pencils
- glue
- scissors

Vocabulary

Carnivore, Herbivore, Omnivore, Producer

Essential Academic

Learning Requirements

Science 1.3

Background

Read

Living things get energy from the food that they eat. Energy to run, to swim, or to fly. Energy to grow, to build homes and to raise young. Here comes a hawk, circling high in the sky. Hawk is very hungry. Suddenly she dives to the ground. She has a mouse! Now she can eat lunch, and feed her little hawk babies. Hawks are called *carnivores* because they only eat other animals.

Ask

"Are you like a hawk?"

(No, people don't eat only meat.)

Read

"Mice, on the other hand, eat both plants and animals. They like seeds and they like insects. They are called *omnivores*. Are you like a mouse?"

Or are you like a deer, who eats only plants? If you eat only plants, then you are an herbivore. Are you an herbivore?

What about plants? Plants are living things. They need energy to grow."

Ask

"Where do plants get energy?"

(Most plants get energy from the sun. Green plants are the only living things that can turn sunbeams into food. They are called *producers*. Animals could not survive without green plant producers. Even hawks need plants, though they eat mice.)

"Why do hawks need green plants?"

(Because mice eat plants. Without plants, there would be no mice, and there would be no hawks. That is the way a food chain works.)

Directions

1) Pass out Worksheets #1 and #2 so that each student has their own copies. Explain: here are some pictures of animals. These animals are hungry. They are thinking about lunch. Ask, "What do you think the (salmon, mink, snail, little brown bat, etc.) is hungry for?" (pause for response)

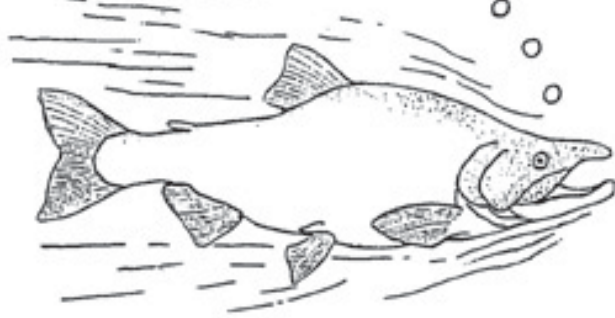
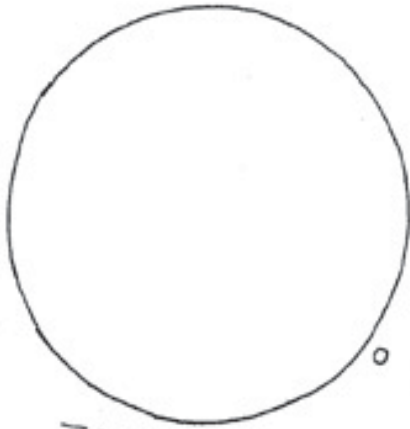
2) Pass out Worksheet #3. Explain: These animals and plants are food for other animals. Ask, "*What do you think would eat a (clam, frog, sedge, etc.)?*" (pause for response)

3) Have the students color in the animals on Worksheet #3. Then have them cut them out and paste them inside the thought bubbles of the animals on Worksheets #1 and #2. Help the students match them correctly.

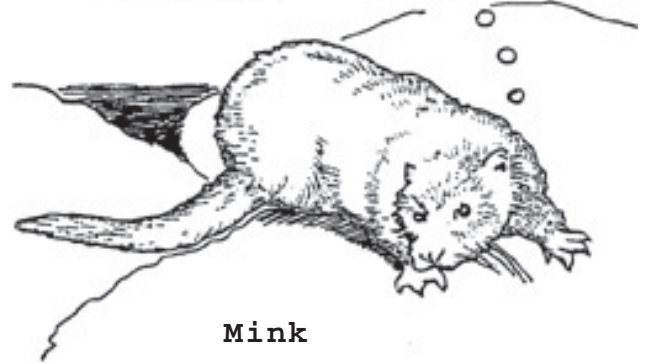
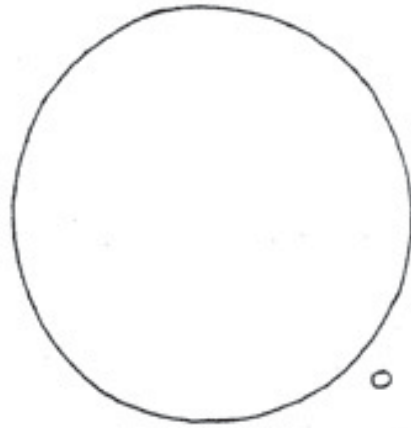
Matches

- Canada Goose – Sedges
- Snowy Owl – Shrew
- Northern Harrier – Frog
- Snail – Duckweed
- Salmon – Stickleback
- Sandpiper – Clam
- Mink – Vole
- Little Brown Bat – Fly

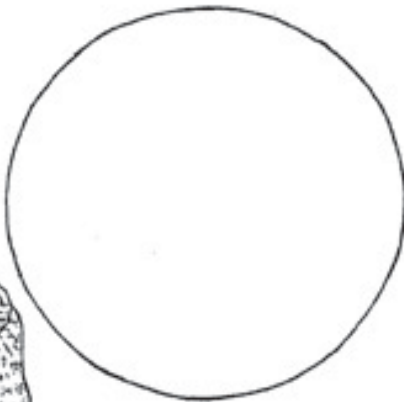
Worksheet #1



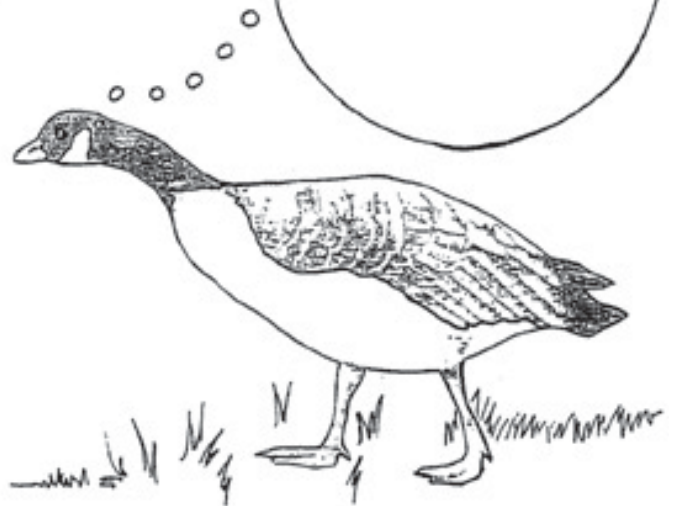
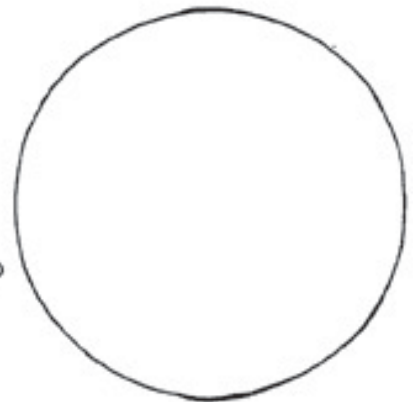
Salmon



Mink

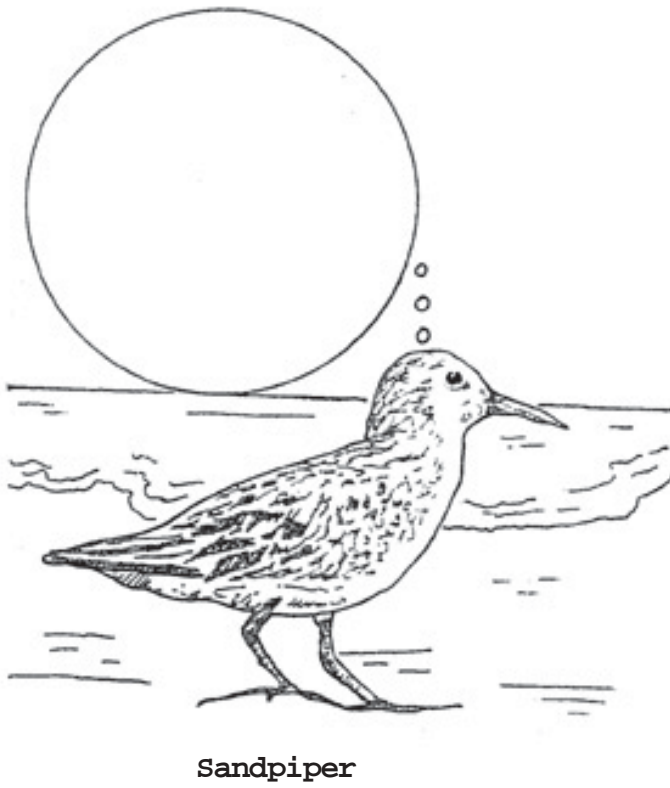
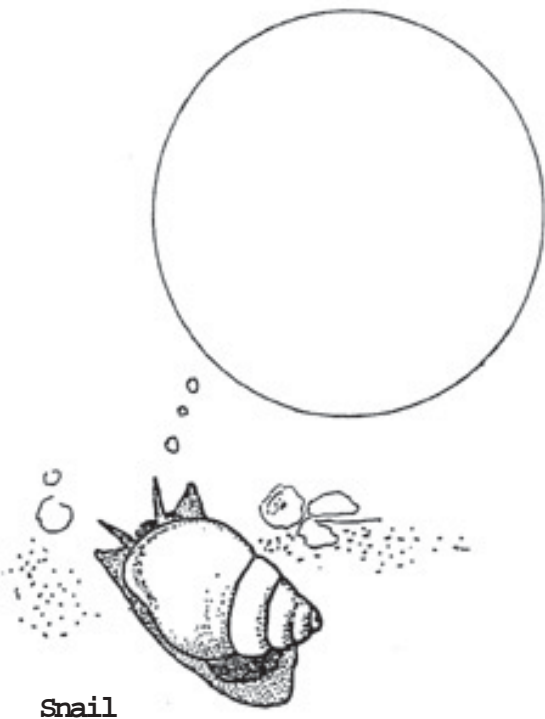


Northern Harrier

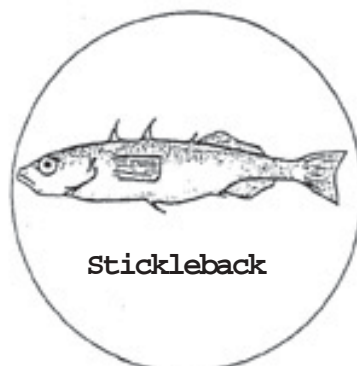
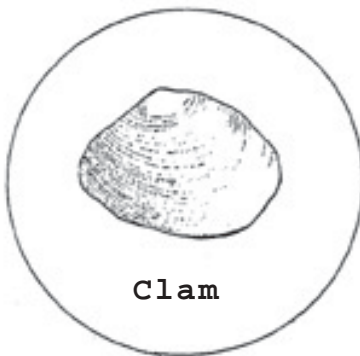
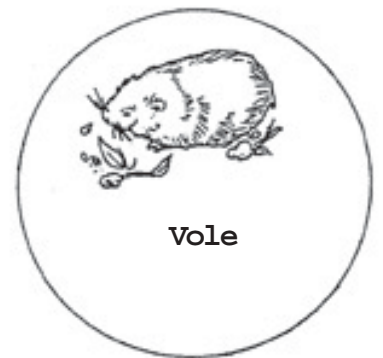
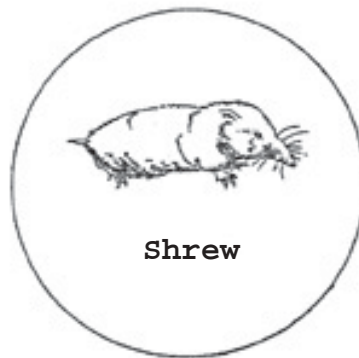


Canada Goose

Worksheet #2



Worksheet #3



Bird Mapping

Birds & Migration Room

Overview

Students use bird band reports to chart the migration of Canada geese, their summer breeding grounds and winter feeding grounds.

Duration

30 minutes

Grades

5-12

Subjects

Science, Geography

Objectives

In this activity students will:

- discover ways we learn about bird migration.
- be introduced to the four major flyways across the US.
- identify the role of the scientist and technology in tracking bird migration.
- explain the purpose of tracking bird migration.
- use real data to chart the migration of Canada geese throughout the seasons, and then analyze and interpret the data.

Vocabulary

Migration, Migration Route, Flyway

Materials

- bird banding reports A & B
- laminated map of United States, Canada and Alaska with state and provincial boundaries (on wall in the education center)
- erasable markers

Essential Academic

Learning Requirements

Science 1.3, 2.2; Geography 1.1, 3.1

Background

Read

"Do you notice the honking of Canada geese in the fall? Do you welcome the trills and twitters that come in the spring? Most birds migrate south for the winter and north for the summer. We don't know all the reasons why they do this. We think that birds follow the abundance of food through the seasons. For example, a goose that feeds in Arctic wetlands leaves his or her home when it freezes over. Such a bird winds up around here, and then disappears again in the summer."

Ask

"Why else do you think birds migrate?"

Read

"In order to protect birds, it is important to know their migration routes. A migration route is the path a bird takes as it travels through the seasons. There are four major bird highways in the United States, called flyways. These are the Pacific Flyway, the Central Flyway, the Mississippi Flyway, and the Atlantic Flyway." (see map)

Ask

"How do scientists keep track of birds?"

(With little aluminum leg bands that identify the age, sex and species of the bird, as well as other information. U.S. Fish & Wildlife Service biologists capture, band and release birds they want to study. Once a bird is banded, it can be reported by hunters, bird watchers, hikers and anyone else who spots it. Biologists use reports to understand about bird populations and bird migration.)

Read

"Anyone can figure out a migration route, provided they have the right information. In this activity, it is your job to discover the areas inhabited by Canada geese through their yearly migration cycles."

Directions

1) Find the key on the map and color each box a different color. The colors represent different seasons and seasonal activities.

*Adapted from "Migratory Mapping,"
Ridgefield National Wildlife Refuge
Educator's Guide*

2) Chose one of the band reports on your data sheet. Read the date and the location. If the bird was spotted in Alaska in August, for example, it was at its summer breeding ground. Mark the location with a dot on the map, using the color you have chosen for that season.

3) Repeat step two for all the band reports.

4) Circle the areas that seem to be used for summer breeding and the areas that seem to be used for winter habitat. Put an arrow next to the locations that show migration, pointing north or south depending on whether the goose was traveling in the spring or the fall. Ask, "*Are you able to look at your map and tell the story of goose migration?*"

5) Ask, "*Which two flyways does your map illustrate?*"

6) Notice the dates of the band reports. Most are during fall migration. Ask, "Why do you think that might be?"

Follow Up

You can help the U.S. Fish & Wildlife Service protect migratory birds. If you see a bird with a bird band, record the numbers on the band. Also write down when and where you saw it. Send your report to:

*U.S. Fish & Wildlife Service
Bird Banding Laboratory
Office of Migratory Bird Management
Laurel, Maryland 20708*

You will be sent a Certificate of Appreciation and the person who banded the bird in the first place will be contacted about your report.

What Can I Eat With This Beak?

**Birds &
Migration
Room**

Overview

Students role-play feeding birds, demonstrating the importance of specialization for biological diversity.

Duration

30 minutes

Grades

5-8

Subject

Life Science

Objectives

Students will:

- identify examples of physical adaptations, and how they enable animals to survive.
- explore the great diversity of birds.
- test the effectiveness of different bird beaks with a number of different foods and habitats.
- explain the relationship between adaptation and biological diversity.

Vocabulary

Physical Adaptation, Habitat

Materials

Habitats

Grassland: straw-filled basket with pingpong or styrofoam balls (field rodents)

Pond: tray of water with floating green beads (algae)

Flower Meadow: several small glass jars filled with water (flowers and nectar)

Mud Flat: solid foam with beads and pipe cleaners (shellfish, shrimp and worms)

Forest: board with holes drilled in it (tree trunk) and beads (insects)

Food

- worms (pipe cleaners)
- bugs (beads)
- rodents (pingpong or styrofoam balls)

Beaks

- tweezers (sandpiper, great blue heron)
- spoon/strainer/net (shoveler, mallard)
- eyedropper (hummingbird)
- tongs (barn owl, peregrine falcon, hawks)

Stomachs

- jars of various sizes
- stopwatch or hourglass
- pencils and paper
- measuring cup

Essential Academic Learning

Requirements

Science 1.1.1, 1.3

Background

Ask

"What do birds do every day of their lives?"

(They gather food! Most people buy dinner at a local supermarket. Imagine if we had to catch a mouse for dinner, or scoop up algae, or dig for worms.)

"Would we use our own two hands?"

(We might use shovels, nets, traps and other tools, in order to make food gathering a bit easier.)

"Do birds use tools?"

(Birds don't have to use tools! Birds are shaped to be expert food hunters and gatherers.)

Read

"Picture a bird, any bird. Are you looking at that bird in your mind? It has a beak, wings and feet. What shape is the beak? What shape are the wings? What shape are the feet? Turn to a partner. Describe your bird to each other, in as much detail as you can."

Ask

"OK, you've now described a bird to someone else, and they've described one to you. Were they different? Why aren't all birds shaped the same?"

(One reason is because they eat different food! Eating different foods allows great numbers of birds to live together in the same habitat. If all birds ate worms, for example, they would run out of worms pretty fast. Then they would be hungry.)

"This exercise is about physical bird adaptations - or the way their bodies are shaped. Do you know what a physical adaptation is?"

(If not, listen to this: Wolves have thick fur, so they can keep warm in very cold places. Wolf fur is a physical adaptation to the cold. Owls can see in the dark, so they can hunt at night. Their eyes are especially adapted to darkness. Sandpipers have long beaks, so they can poke way down in the mud for worms and clams. Their beaks are special physical adaptations for eating clams and worms. This activity is about the many types of beaks birds have adapted for different foods.)

Adapted from "What Can I Eat With This Beak?," Ridgefield National Wildlife Refuge Educator's Guide

Directions

- 1) Observe the many different kinds of beaks in the bird beaks display.
- 2) The rest of the activity is to be conducted in the center room at the table next to the sink. Bring the box labeled "Habitats" and the box labeled "Beaks and Stomachs."
- 3) There are jars and utensils in the box labeled "Beaks and Stomachs." Each player can choose one utensil to use as a beak, and one jar to use as a stomach.
- 4) Station the five different habitats evenly around the table.
 - Fill the tray with water and dump in the green beads. This represents a pond environment with algae or duckweed.
 - Put all the foam balls in the basket with the grass. This represents a grassland with small mammals, like mice.
 - Fill the little glass jars with water. These are flowers full of nectar.
 - There is a piece of wood with holes drilled through it to represent a tree trunk. Make sure all the holes have beads in them – these are the insects.
 - The foam with pipe cleaners and beads represents a mud flat with worms, clams and shrimp.
- 5) Pass out a piece of paper and a pencil to each player.

Activity Rules

Station a player at each habitat. If you have extra players, line up behind *one* habitat and wait to rotate in. Your job is to gather as much food in each habitat as you are able. Each person gets twenty seconds alone at each habitat. Your group leader will signal you when to start and when to stop. You can use only your "beak" to pick up food. Once you have picked up the food, you must drop it into your jar – your "stomach". You cannot scoop up food with your jar. When you are finished at one habitat, count the food or measure the liquid you have been able to gather. Write the number down on your piece of paper. Put all the food back. Move to the next habitat, and wait for your group leader to signal you to begin. Good Luck!

Follow Up

Please record your answers:

- 1) Ask, "*What kind of bird are you?*" Write the type of beak you have at the top of your paper. Make a guess as to what type of bird you might be and write this down at the top of your paper too.
- 2) Ask, "*In which habitat did you have the most success?*" Number each habitat 1-5, one being most successful and five being least. Compare your results with other players.
- 3) Ask, "*What are you best suited to eat? Why?*" Compare your results with other players.
- 4) Ask, "*How does it benefit birds to have different types of beaks?*"

The Web Of Life

Endangered Species Room

Overview

Students learn how interdependent life is on earth by building a physical web between animals, plants and the natural elements, and then proceeding to take it apart.

Duration

15 minutes

Grades

3-12

Subjects

Science; Communication

Vocabulary

Biosphere, Extinct, Interdependent, Adaptation

Objectives

Students will:

- Identify conditions within the biosphere that make life possible on earth.
- Trace the movement of energy through the biosphere.
- Explain particular relationships between animals, plants and elements.
- Demonstrate the interconnectedness of life, and the domino effect when one species suffers severely.
- Relate to the web of life as a participating member who can effect the quality of life for other beings.

Materials

- 1 ball of string
- identification necklaces

Essential Academic

Learning Requirements

Communication 3.2; Science 1.3, 2.1

Background

Read

"Biosphere is a word that describes a very thin layer between earth and space. In this very thin layer, living things have everything they need to survive, including water, oxygen and the warming light of the sun. As far as has been scientifically proven, there is only one biosphere in all the universe.

There is no waste within the Earth's biosphere. Every element and every living being contributes to the intricate network of global life. This includes the light that filters through our atmosphere, the plants that spin light into food for animals, and the cougar that stalks the mouse in the grass.

Life on earth is interdependent. Salmon need trees to shade them when they are young, and trees need fish carcasses to fertilize them, so they can be healthy. Trees and fish are interdependent. Animals and plants count on each other for food, shelter, warmth, protection and everything they need to survive."

Ask

"Are you a part of the web of life?"
(You bet.)

Read

"The way you live affects your environment and all life surrounding you. Every day, whether you know it or not, you make choices that could mean life or death to someone else. Recycling is a choice that makes way for life. Recycled products do not go to the dump. The more we recycle, the smaller our landfills. The smaller our landfills, the more room there is for habitat like woods, fields and wetlands. Animals need woods, fields and wetlands to live. The way we behave effects our biosphere no matter what. The following activity is designed to illustrate what interdependence looks like."

Directions

Read

- 1) Each person needs to pick out an identification necklace. You can be an animal, a plant, or an element, such as the sun. Hang your necklace around your neck so everyone can see what you are.
- 2) Stand or sit in a circle.
- 3) Take turns tossing the ball of yarn from one person to another. Before you pass the ball, explain how your organism or element is related to the organism or element of the person you are passing to. The relationship can be direct, as in "I am an owl and I eat mice" or indirect, as in "I am a deer, and by eating plants I get energy from the sun." Keep hold of a piece of the yarn. By the time everyone has had a turn, there should be a taught web of yarn stretched across the circle.
- 4) Now everyone is connected.

Ask

"What happens if one plant or animal becomes extinct?"

(Extinction means there is not a single one of that plant or animal living on earth, and there never will be again.)

"Who will pretend you have gone extinct?"

(Just one person.)

Read

"Now, imagine that your habitat has been destroyed by pollution or development. Raise your part of the web."

Ask

"Does anyone else feel your part of the web being tugged on?"

(Raise your string if you do.)

"How many people are holding up their string?"

"What does this show about the web of life?"

"What does this web show about all life on earth?"

Read

"Everyone put down your hands. Now unwind the web in reverse. The final person to receive the ball last time will be the first to pass it this time."

Once the web is unwound, the activity is completed. You may wish to follow up by drawing pictures, writing or discussing the interconnectedness of life.

All Things Seaward

Earth Stewardship Room

Overview

Students learn about watersheds and pollution by using a watershed model to simulate what actually happens to pollution in watersheds.

Duration

20 minutes

Grades

K-8

Key Concept

Everyone lives in a watershed. Pollution affects an entire watershed, including people living upstream and downstream, and wildlife living in the watershed. Pollution can be minimized.

Objectives

Students will be able to:

- define a watershed.
- name sources of pollution in a watershed and some impacts pollution has on wildlife and humans.
- determine ways to reduce pollution.

Materials

- watershed model
- spray bottle with water
- toy buildings, cars, roads, fences, bulldozers, farm animals
- ground pepper in a shaker
- ink with eyedropper

Essential Academic

Learning Requirements

Communication 3.1, 3.2, 3.3,
Science 1.3, Geography 1.1,
1.2, 3.1, 3.2, 3.3

Background

Use the model of the watershed in the Earth Stewardship Room. Gather students around the model.

Ask

"What is this model depicting? Can you describe it?"

Read

"This is a model of a watershed – the Nisqually River Watershed. Nisqually National Wildlife Refuge is at the end of the watershed near Puget Sound. A watershed is a region that drains into the same body of water. Watersheds drain all the rainwater and all the meltwater from mountain glaciers and ridges down to the sea. If you could stand on top of Mount Rainier and looked down on a few valleys at the same time, you would be able to see several watersheds at once."

Ask

"Where is the lowest point on earth?"
(Ocean.)

"If you wanted to find a river, which way would you head?"
(Downslope.)

"Sometimes rain doesn't soak into the earth right away. In places where the earth is paved over, such as in parking lots and on roads and sidewalks, the water has to find a storm drain to reach the river. This water is called runoff because it runs off the cement instead of soaking in. If dirt, oil or garbage gets in the way of runoff water, it goes down the storm drain! And where do storm drains lead?"

(Into the rivers and some straight to Puget Sound or the ocean.)

"When dirt, oil or garbage gets in the water, it is called pollution. This is because it causes problems for fish, wildlife and humans. Can you think of anything else that would become pollution if it got into a stream, a river, or the ocean?"
(Sewage, animal feces, chemicals such as bleach.)

Most pollution is caused by human activity. There is no human activity on this model of our watershed yet. It is your job to develop this model to look more like it is lived in by humans.

Directions

- 1) Point out Mount Rainier, the source of the Nisqually River, and Puget Sound right next to Nisqually National Wildlife Refuge.
- 2) Place the toy pieces on the watershed model.
- 3) Ask, "*Where on this model do you think pollutants might enter the watershed?*" Sprinkle pepper, or use ink dropper next to each potential source of pollution.
- 4) Here comes a storm! Spray the entire watershed evenly with the water bottle, lightly at first, and steadily harder and harder until little rivers form carrying the pollution downstream.
- 5) Stop spraying. The rain clouds have dispersed. Ask, "*Where is all the pollution now?*" (In Puget Sound).

Discussion Questions

Do you think our Puget Sound is polluted? (Yes.)

Do you think our rivers are polluted? (Yes.)

If the watershed is polluted, the rivers and the sea are polluted. Does water travel underground too? (Yes.)

Do you think it can carry pollution with it? (Yes.)

If you dump soap in the yard, where do you think the soap goes? (Into rivers and eventually into Puget Sound.)

Read

"Pollution can kill wildlife, or make living very difficult for them. Chemicals can poison food and water for all living things. Oil can glue a bird's feathers together so it can't fly. Unable to fly, a bird will die. Too much dirt in a stream will smother baby salmon eggs, fish and insects, because they can't breathe dirt! These are just some of the effects on wildlife and humans by polluting our watersheds.

There are lots of ways to prevent contaminating our watershed. One way is to allow the water to soak into the ground first. This allows the soil to filter out the pollution, so that by the time the water reaches the stream, it is clean. Another way is to plant lots of trees. Trees hold soil in place with their roots, so that the dirt doesn't get washed into streams. And humans can be careful about what they put into the watershed.

Look at the model again. Point to all the places where pollution can enter the watershed. For each place, explain what people could do to prevent pollution." (Use fewer pesticides, chemicals on lawns, yards and farms; plant trees to absorb more water and trap sediment; don't dump chemicals or pollutants down the drain, etc.)

From Marsh to Metropolis

*Cultural History of
the Nisqually
Watershed Room*

Overview

In this activity, students put drawings showing the historical development of Puget Sound estuaries and marshes into the correct chronological order.

Duration

20 minutes

Grades

K-6

Key Concepts

Salt marshes and estuaries once emptied into Puget Sound. As people settled and built around the Sound, salt marshes and estuaries were lost to development. Today, less than 25% of the original salt marshes and estuaries remain.

Objectives

Students will be able to:

- recognize that more than 75% of salt marshes and estuaries around Puget Sound have been lost due to development and population growth.
- describe the historic settlement of Puget Sound by Native Americans, Europeans and Americans, and their effects on salt marshes and estuaries.

Materials

- picture cards
- felt hanging

Essential Academic

Learning Requirements

Communication 3.1, 3.2, 3.3;
Social Studies: History 1.1,
1.2, 1.3, 2.2, 2.3, 3.2, 3.3;
Geography 2.3, 3.1, 3.2, 3.3

Background

"Why do you think salt marshes and estuaries around Puget Sound are important?"

(Salt marshes and estuaries provide habitat for endangered species and many other plants and animals; they are a nursery for birds and fish; they help prevent floods and they filter pollutants and sediment; they provide recreational, scientific, and educational opportunities for many people.)

Directions

1) Stack the 20 blocks together. These represent the amount of salt marshes and estuaries around Puget Sound over 200 years ago. Ask, *"How many still exist today?"* (Have students take guesses and vote on how many to remove.)

2) Read, *"Over 75 percent of salt marshes and estuaries have been lost to development over the last 200 years, which would mean that only 5 'blocks' remain (gather 5 blocks). Less than 5 out of every 20 acres of salt marsh and estuary still exist today. We have built, buildings, houses, roads, airports, farms, parking lots, and landfills on top of salt marshes. We have also dredged some of these habitats to create shipping ports such as in Tacoma, Olympia and Seattle."*

3) Using the laminated pictures and the felt wall hanging, have students arrange the drawings in order from the least amount of human impact (marsh) to the greatest (metropolis). Each picture is lettered in the upper left hand corner for reference only; the letters have nothing to do with the order of the pictures

4) When the group has finished ordering the pictures, ask one person to read off the letter order of the set from least human impact to greatest. The correct order is D, B, F, A, C and E. Use the following information to discuss each picture.

Adapted from "From Marsh to Marina," Nature Scope: Wading into Wetlands, "Where Have All the Wetlands Gone?," Wetland Protectors, and "From Marsh to Metropolis," Salt Marsh Manual

Read

Picture D: Native Americans were the first people to use the resources of the salt marshes and estuaries. The Nisqually and Puyallup Indians depended on the estuaries in Puget Sound, especially the estuaries and salt marshes of the Nisqually and Puyallup Rivers. They found plenty of game in salt marshes, especially in the fall when huge flocks of ducks and geese passed through Puget Sound during their migrations. Indians caught salmon and other fish from the rivers and gathered oysters, clams and other shellfish along the mud flats and sloughs. (1700s and prior)

Pictures B and F: Beginning in the early to mid 1800s, British fur trappers and settlers were the first European settlers to live near salt marshes. The British, followed by American settlers logged, farmed and raised livestock. There was plenty of food for people and the vast fields of salt grass supported grazing animals. (early to mid-1800s)

Picture A: The California Gold Rush, which began in 1849, brought thousands of new settlers to the west coast from the eastern United States. Timber and trade became large industries in the Northwest supported by the Gold Rush. The growing population began to have a larger impact on the salt marshes. There were no hunting regulations and some species were hunted almost to extinction. Sandpipers and other salt marsh birds were hunted for their meat. Egrets and herons were killed for their feathers which had a commercial value. Many salt marshes and estuaries were dredged for shipping ports, diked to support farming, or used as dumpsites for garbage and sewage. There were no regulations regarding garbage and sewage dumping, causing serious land and water pollution problems. (1849 to early 1900's)

Pictures C & E: By the 1950s, people had drastically changed many of the original salt marshes. Few people recognized the importance of leaving salt marshes and estuaries in their natural state. To turn marshes into "useful" places, they often built airports, houses, farms and landfills on top of them, or dredged them into large ports like Seattle and Tacoma. Today, many marshes have been completely built over and destroyed, with no sign of the original marsh or wildlife. (1950 to present)

Read

"Today, laws protecting salt marshes, wetlands and estuaries exist. Some areas of salt marsh have been designated as wildlife refuges, such as here at Nisqually National Wildlife Refuge. In the early 1900's, this area was a farm with a dairy, chickens, hogs, an orchard and honey bees. Over twenty-five years ago, plans were developed to put a landfill here or dredge it for a deep water port. However, people worked to protect it for wildlife instead."

Discussion

"What are some ways that you can protect salt marshes, wetlands and estuaries?"

(Learn about salt marshes, estuaries and wetlands and teach others; write letters to legislators; reduce, reuse and recycle; participate in Coast Clean-ups or Stream Team restorations, never litter; never dump things down storm drains; label storm drains with warnings, such as "Do Not Dump, Flows to Bay.")

Plants and People

Cultural History of the Nisqually Watershed Room

Overview

In this activity students will guess historical uses of native plants by the Nisqually Tribe. They will solve riddles to identify native plants and discover samples of plants inside different boxes.

Duration

10-15 minutes

Grades

3-7

Objectives

Students will be able to:

- identify common native plants to the Refuge.
- describe common uses of specific plants by the Nisqually Tribe.
- understand the historical and current importance of plants to people.

Materials

- 6 different plant riddle boxes
- plant painting on wall

Essential Academic

Learning Requirements

Communication 3.1, 3.2, 3.3;
Science 1.1, 1.2; Geography
3.1, 3.2, 3.3; History 1.1, 1.3,
3.3; Art 2.1, 2.2, 4.1

Background

Have you ever harvested your own food? Or built something just from items you found in nature?

A long, long time ago there were no supermarkets or shopping malls. People had to gather all their own food and make all of their supplies from what they found growing on the land. The Nisqually Tribe once used the land in the Nisqually Delta, now the Nisqually National Wildlife Refuge. Although their permanent homes were farther up the river, they came down to the Delta often to gather food and supplies for their survival.

Ethnobotany (*eth-no-bot-any*) is the study of how people used plants. The Nisqually Tribe used plants for many different things including food, medicines, fishing nets, boats, clothing, shelters and eating utensils.

When British and American settlers moved in and started farms, they brought many *nonnative* plants with them. A nonnative plant is a plant that wasn't here originally. Plants that were here long ago are called *native* plants. Some non-native plants become *invasive*. Invasive plants crowd out native plants and take over an area. Nisqually National Wildlife Refuge manages invasive plants by removing them and replanting native plants.

Directions

- 1) Each person picks up a box. *Don't open the box!*
- 2) One person at a time will read the description on the front of the box.
- 3) Everyone will look at the plants on the painting and guess which plant was just described.
- 4) After you think you know which plant it is, open the box to find out if you are right! Look at the contents of the box, handle the plant materials gently, and read the cards inside the box.

Discussion

"Can you think of some plants that we use today?"

"What kinds of things are they used for?"

Where the River Meets the Sound



Outdoor Activities

Habitat Comparison Walk

Mini-Expedition

Wild Words: A Journal Activity

Scavenger Hike: Can You Find It?

"Come forth into the light of things.
Let nature be your teacher."

— *William Wordsworth*

Habitat Comparison Walk

Overview

Students will observe five habitats on their hike along the Twin Barns Loop Trail, identifying plants and animals in each habitat and working on a habitat worksheet.

Duration

1 to 1 1/2 hours

Grades

K-6 (K-2 and 3-6 versions of habitat worksheets)

Subject

Science

Key Concept

A habitat is a home for an animal or plant. It provides suitable food, water, shelter and space. Each habitat supports plants and animals adapted to living in the habitat.

Objectives

Students will be able to:

- identify and compare five different habitats on the refuge – riparian forest, woodland, river, grassland and freshwater marsh
- identify one plant or animal found in each habitat
- name one reason each habitat is important

Materials

- clipboards and pencils
- copies of habitat worksheet or drawing worksheets
- site habitat map
- bird and plant identification books or charts

Essential Academic

Learning Requirements

Science 1.1, 1.2, 2.1, 2.2;
Geography 2.1, 2.2, 2.3, 3.1, 3.2; Communication 1.2; Math 4.1; Health and Fitness 1.1, 1.2 and Reading 3.2; if drawing worksheets, add Arts 1.1, 1.2, 1.3 and 4.1.

Choose between appropriate worksheets provided. Do not attempt to do drawing worksheets and a habitat hunt sheet in an hour.

Outline

Introduction (10 min)

- Discuss definition of a habitat
- Hand out clipboards, pencils and worksheets (*if provided*)

Habitat Hike (45 min)

- Hike Twin Barns Loop Trail from Visitor Center (or Education Center).
- Stop at the stops identified on map: discuss the characteristics of the habitat; identify plants and animals dependent on that habitat, choose a habitat worksheet for students to complete.

Discussion (3 min)

- Go over the Habitat Hunt, grades 3-6 use the answer sheet.
- Discuss the importance of preserving habitat for wildlife and people.

Background

- A habitat is a home for a plant or animal.
- Each habitat has its own unique characteristics (e.g. a river is very different from an ocean).
- Each habitat provides food, water, shelter and space suitable to its inhabitants' needs.
- At Nisqually NWR, there are a variety of habitats, each of which supports different plants and animals.
- A description of each habitat you will be exploring is found below. For more information, see the Habitats of the Refuge on pages 11-16.

Riparian Forest

- The plants in this riparian forest are adapted to handle tidal flooding twice a day. This forest is one of the rare, naturally-occurring, deciduous, riparian forests found in Western Washington.

- The deciduous (leaves fall in autumn) trees include: black cottonwoods, big leaf maples and red alders which provide nesting habitat for woodpeckers and great horned owls. Other riparian forest plants include: red alder, Oregon ash, willow, salmon berry, skunk cabbage, scouring rush (a type of horse tail), moss, lady fern and licorice fern.
- Animals that use the riparian forest for food and shelter include: yellow-rumped warblers, which feed on caterpillars and insects, and rufous hummingbirds, which feed on sap and nectar of flowers. Also, rough skinned newt, various frogs (red-legged and Pacific tree frog) can be found in the riparian forest.

Woodland

- The woodland is a semi-natural woodland, which used to be like the riparian forest, but was logged, diked and farmed.
- The woodland includes native trees like the red alder, black cottonwoods and big leaf maples, but less dense than the riparian forest.
- Many of the understory plants are a mix of nonnative plants like the Himalayan blackberry, ivy, which are in the process of being restored through cleaning, contouring and replanting with more native plants.

River

- The Nisqually River's source is the Nisqually Glacier on Mount Rainier. The river gathers water from other tributary streams and slows and widens as it reaches the delta. The delta has been formed by the river carrying and dropping sediment as it slows to meet Puget Sound.

- River birds include: common merganser, double-crested cormorant, great blue heron, and belted kingfisher, which eat fish. Ducks also gather here occasionally.
- The major animals found in and along the river include: river otter, harbor seals, deer (along the banks and sometimes crossing the river) and beaver.
- The river is one of the remaining areas for endangered salmon including chum, coho, Chinook and pink, which gather here before journeying to spawning grounds further upstream.
- The river is affected by the tides. When the tide is high, the river also is high. Conversely, a low tide will produce lower water levels in the river. Also, the river water can be cloudy or clear. Often in the spring, as snow melts on Mount Rainier and in the Nisqually watershed, the influx of water brings more sediment into the river than usual. This, in turn, makes the water cloudier.

Grassland

- The grasslands are a remnant from the days when the delta was a farm. The hay it produces is now mowed every summer to provide green forage for Canada geese, American widgeon and mallards during the fall and winter.
- Animals use the grassland for hunting. In particular, red-tailed hawks and Northern harriers hunt for mice (deer) and voles (Townsend's voles).
- Other animals found on the grassland include: red-legged frogs, garter snakes, Pacific tree frogs.

- The grassland plants are mostly nonnative plants and include creeping bentgrass, reed canarygrass, velvet grass, black medick, Canada thistle and quackgrass.

Freshwater Marsh

- Freshwater marshes can be found inside the Brown Farm Dike Trail. Shallow seasonal marshes water levels are managed by the Refuge to be dry in the summer and refill in the fall. This management offers prime nesting and feeding habitat for migrating ducks. Refuge staff are continuing to restore this marsh by planting native species and removing invasive plants.
- The freshwater marsh is home to mallards, marsh wrens, bitterns, mink, river otter, beaver and deer. In the spring, the marsh is home to many red-winged blackbirds.
- Primary plants are cattails, reed canarygrass (invasive), duckweed, pacific willow, nightshade (nonnative), crab apple, red elderberry and nettles.
- Amphibians include: red-legged frogs, Pacific tree frog and bullfrogs (invasive).

Shrub

- Bush rows along ditches, sloughs and the Brown Farm Dike provide blackberries, rosehips and crab apples for migrating song birds such as thrushes.
- The thick brush also provides shelter for sparrows, towhees and juncos year-round.
- Other plants include: bittersweet nightshade (invasive) and snowberries (also known as waxberry).

Coniferous Forest

- Tall Douglas fir trees have regrown on the bluffs overlooking the delta. This area used to contain an old growth forest that was logged many years ago. Bald eagles use the tall firs as lookouts. At least one pair nests here every spring.

Salt Marsh and Nisqually Flats

- Where the salt water meets the freshwater, an estuary, or salt marsh, is created. Plants such as pickleweed and Puget Sound gumweed are adapted to handle the high salinity of the water. Estuaries are a nursery for many species of fish and birds and are especially important for juvenile salmon. The salt marsh is on higher land than the mudflats and contains more shrub-like plants.
- The extensive mud flats are home to clams, worms and other filter feeders, which provide a plentiful food source for migrating shorebirds.

Twin Barns Loop Trail

including Riparian Forest and Nisqually River Overlooks

Introduction (10 min)

Do

Begin the hike with a habitat discussion on the back deck by the Visitor Center.

Ask

"Can anyone tell me what a habitat is?"
(A home for a plant or animal.)

"Are all habitats the same?"
(No.)

"Can anyone identify the habitat we are standing on?"
(Freshwater Marsh.)

"What animals might live in the freshwater marsh?"
(Ducks, frogs, deer – out in the middle.)

"Can you see the grassland from here?"
(Yes.)

"Where is it?"
(The grassy area to the west/left of the deck.)

"What are some differences you can see between the marsh and the grassland?"
(The marsh is at a lower elevation, has more water, rushes and shrubs than the grassland; the color.)

Read

"Okay, we're almost ready to head out. But before we start our hike we need to get our equipment."

Do

To each student, hand out: a clipboard, a pencil, a pair of binoculars (if provided), and a Habitat Hunt Sheet (choose from the various options in this section).

Read

"While we are hiking we will be observing each of the habitats, looking for plants, animals and evidence of animals. You will be working on the Habitat Hunt Sheet. Begin by writing your name on the sheet. I will collect it later. Let's start the hike!"

Habitat Hike (about 1 hour)

STOP #1: RIPARIAN FOREST

Do

Start by taking a left out off the Visitor Center ramp and starting on the Twin Barns Loop Trail. Walk along the trail. Follow the Riparian Forest Overlook and stop at the end (with benches). You will see several types of trees around the end of the walkway, including red alder, black cottonwood and big leaf maples.



Black Cottonwood
Populus balsamifera



Oregon ash
Fraxinus latifolia



Big Leaf Maple
Acer macrophyllum



Red Alder
Alnus rubra

Ask

"The trees closest to the walkway are native to Washington. What does native mean?"

(The plants grew in Washington before it was settled by Europeans.)

"What do the leaves of the trees look like?"

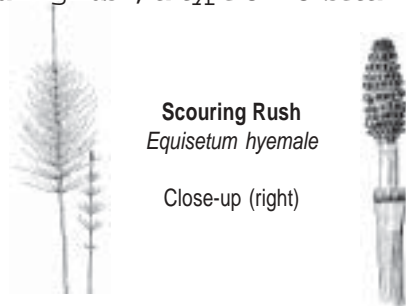
(Red alder has jagged edges, black cottonwood is shaped like a spade or heart and big leaf maple has five distinct fingers.)

"Can anyone name one of these trees?"

(See above for distinguishing leaves. Also black cottonwood has deep trunk ridges.)

"Does everyone see the tall, green plants? Does anyone know what these plants are?"

(Scouring rush, a type of horsetail.)



"Can someone name a distinguishing feature of these plants?"

(Small, vertical segments make up the tall, slender plant. They also grow in bunches with several growing out of a small area.)

"Is the area around the walkway muddy or full of water?"

(Could be either.)

"This area is unique because it is flooded twice a day by the river at high tides. What would happen if you had to drink several gallons of water, but only twice a day? What does that mean for the plants in this area?"

(You would feel overwhelmed by the amount of water! The plants in the Riparian Forest have to be adapted to handle a lot of water at regular intervals.)

"Do you think you would find these same plants in a desert?"

(No.)

STOP #2: WOODLAND

Do

Walk back down the walkway and join up with the Twin Barns Loop Trail. Head North (to the right) on the boardwalk. Stop right before the bend in the walkway with a slightly wooded area to the left and right of the trail.

Ask

"What is different about this area from the Riparian Forest where we just stopped?"

(There are fewer trees, it's more open, and not as wet.)

"What is similar?"

(Same types of trees.)

"Does everyone see the dead trees out to the left? These are called snags. Can anyone guess why snags are important?"

(Snags have a lot of insects and provide food for birds like woodpeckers – note the holes in the tree trunks. Once these holes are created, other birds, like swallows can use them for nests in the springtime. They become high-rise apartments for birds in the spring!)

STOP #3: WOODLAND

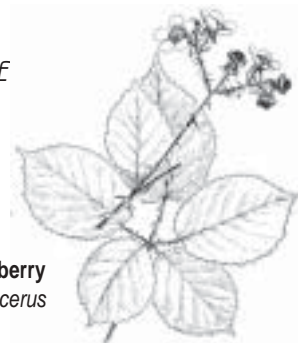
Do

Continue on to the next set of benches. You are still in the woodland. You will be pointing off the left of the boardwalk.

Read

"Take a look at the line of plants right along the boardwalk. These are Himalayan blackberries. It is an introduced plant."

Himalayan blackberry
Rubus procerus



Ask

"What does introduced mean?"

(It was brought here by humans from another area. It was not here naturally.)

"Compare this area to 15-20 feet beyond the boardwalk. What is different?"

(It is grassier, there are not any or many blackberry bushes.)

Read

"Introduced species often take over the habitat of native species. They can become invasive plants. They especially thrive in disturbed area of the habitat. The boardwalk and trimming of bushes to keep the boardwalk clear has disturbed the area close to the boardwalk, but not further away. That is why you see the introduced blackberries close to the boardwalk, but not further away. Refuge staff attempts to manage these plants by removing as many as possible."

STOP #4: RIVER

Do

Continue walking north along the boardwalk. Where the Twin Barns Loop Trail turns west (left) you will notice an overlook for the Nisqually River further up the trail (150 yards, to the right). Stop at the platform that overlooks the river.

Ask

"Do you see any animals in or along the river?"
(Look across for the great blue heron, ducks, river otter, seals and kingfisher.)

"What kinds of plants grow along river?"
(Rushes, shrubs and trees.)

"What types of endangered species live in or along the river?"
(Salmon - chum, coho, chinook and pink. Bald eagle.)

"What types of animals might eat a salmon?"
(Northern harriers, bald eagles.)

"If the salmon or bald eagle were to become extinct, would it affect anything?"
(The animals that feed on it would have one less source of food. We would only be able to see salmon in pictures.)

"Why are the bald eagle and salmon endangered?"

(Salmon - overfishing, pollution, loss of habitat. Bald eagle - pollution, loss of habitat.)

"Why should we protect the remaining fresh water wetlands and estuaries?"

(It is the home of many plants and animals, including the bald eagle and other endangered species.)

STOP #5: GRASSLAND

Do

Walk back to the Twin Barns Loop Trail and walk west towards the Twin Barns. Follow the walkway up to the observation platform next to the north barn. Stop here and direct students attention to the grassland. (Check the time. Skip this section, if you are running behind.)

Ask

"Does anyone know which habitat this is?"
(Grassland.)

"How is this different from the other habitats we have seen? "

(No trees, lots of grass, some shrubs, more birds.)

"What kinds of birds do you see?"
(Mallards, Canada geese, Northern harriers, bald eagles.)



Mallard



Canada Goose



Northern Harrier



Bald Eagle

Read

"This grassland was created by a dike built around this area to keep saltwater out and allow farming before this was turned into a Refuge. The grassland is one of the habitats left over from the farming days. It still grows hay that is mowed for local farmers, which allows the younger grasses to grow up in the fall and provide fall and winter food for ducks, geese and other birds."

STOP #6: FRESHWATER MARSH

Do

Join back up with the main trail and follow until you reach the next set of benches, which overlook the freshwater marsh. Identify: cattails, duckweed, willows and ducks.

Ask

"What is the name of this habitat?"
(A freshwater marsh.)

"How is this habitat different from the grassland?"
(Its wetter, has ponds. It is an aquatic habitat.)

"Can you see any animals in the freshwater marsh?"
(Look for birds, such as wood ducks, mallards and small mammals such as river otter, mink and mice. Also look for amphibians such as frogs and snakes.)

"Can you see any plants in the freshwater marsh?"

(Cattails, rushes and duckweed are the predominant plants.)

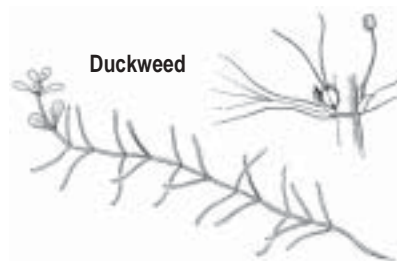


Cattails

Rushes



Duckweed



Read

"Over 75% of wetlands such as this freshwater marsh have been lost due to development, diking, filling or dredging. This habitat provides an important sanctuary for species that depend on it to survive. The Refuge also manages the wetland by raising and lowering the water levels at different times of the year to aid nesting and food production."

Do

Continue your hike along the Twin Barns Loop Trail until you reach the Visitor Center.

Discussion (3 min)

Ask

"What can you do to keep these Refuge habitats clean and healthy?"

Do

Have older students write their response to this question. Have several students share their response with the group. Collect the pencils, clipboards and Habitat Hunt Sheets.

Habitat Study Questions








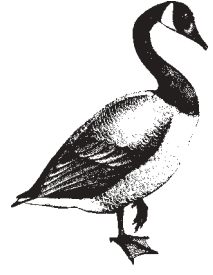



Directions: For each habitat answer the following questions



1) What is the name of the habitat?					
2) Describe it.					
3) What animals or evidence of animals do you see?					
4) What else might live in this habitat?					
5) Why would an animal want to live in this habitat?					
6) Describe the plants you find here.					
7) Draw a plant and an animal you see.					






Habitat Hunt (Grades K-2)

Check off the things you see!

<p>Skunk Cabbage in the riparian forest</p> 	<p>Animal Tracks in the mud</p> 	<p>Dark green horsetails</p> 
<p>White berries on the snowberry bush</p> 	<p>The River is</p> <p>HIGH</p> <p>LOW</p>	<p>Maple trees in the woodland</p> 
<p>Himalayan Blackberry along the boardwalk</p> 	<p>Great Blue Heron in the river</p> 	<p>Canada Geese feeding in the grassland</p> 
<p>Northern Harriers soaring above the grassland</p> 	<p>Cattails growing in the freshwater marsh</p> 	<p>Ducks swimming in the freshwater marsh</p> 






Habitat Hunt Sheet (Grades 3–6)

Fill in the blanks or circle the correct answer.

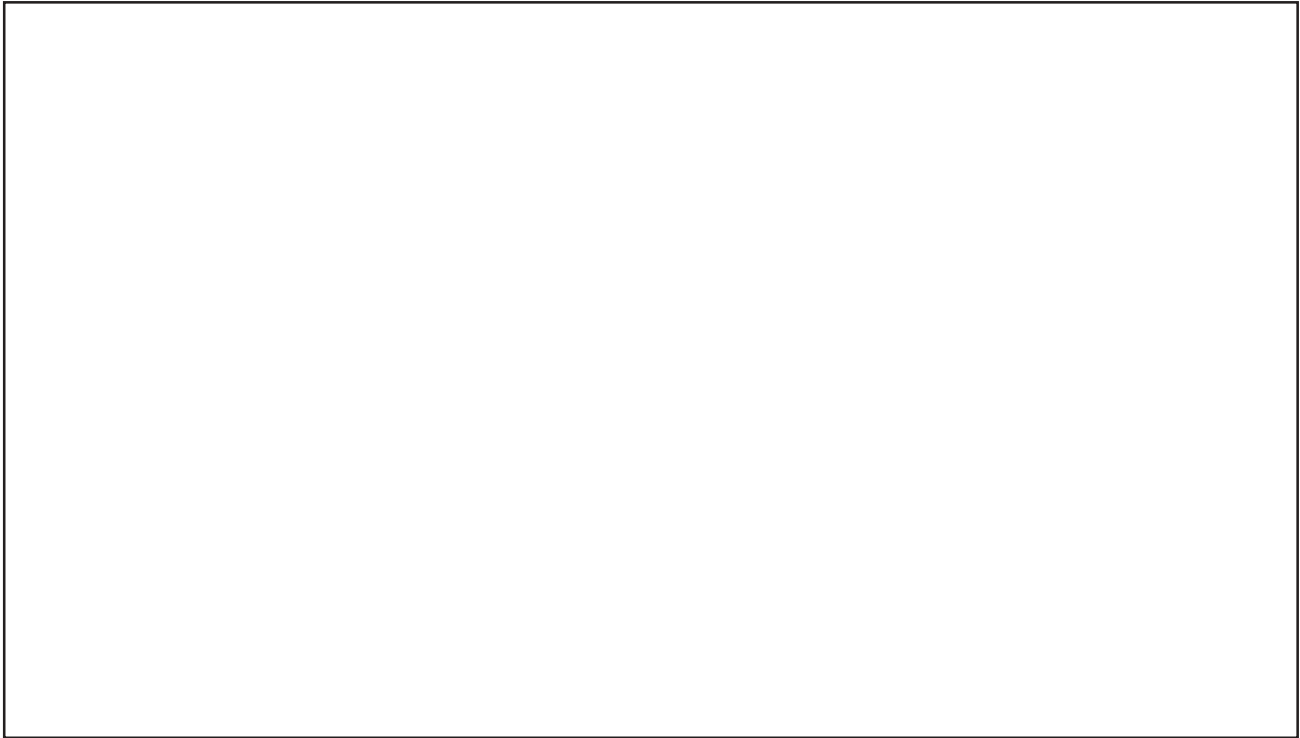
My name is _____ _____	Today the weather is WET DRY _____ SUNNY CLOUDY _____ COLD WARM HOT	A habitat is a _____ _____ _____	The Visitor Center is built closest to the GRASSLAND FRESHWATER MARSH
The riparian forest floods _____ times a day. The riparian forest connects to this body of water _____	The water in the riparian forest is HIGH LOW	Black cottonwood is a native plant of _____ 	Himalayan blackberry is a NATIVE NON-NATIVE plant. 
Skunk cabbage grows in the _____ It smells  _____	Northern Harriers hunt for _____ in the _____ habitat. 	Voles live in the _____ habitat. They eat _____	I spotted a _____ _____ _____ in freshwater marsh.
Cattail grows in the _____  _____	Many species of salmon are ENDANGERED THREATENED	In the grassland, I found DUCKS HAWKS GEESE WIDGEONS	I can keep the Refuge habitats healthy and clean by: _____ _____ _____

Habitat Hunt Answer Sheet (Grades 3–6)

Fill in the blanks or circle the correct answer.

My name is _____ 	Today the weather is WET DRY _____ SUNNY CLOUDY _____ COLD WARM HOT	A habitat is a <i>home for a plant or an animal</i>	The Visitor Center is built closest to the GRASSLAND FRESHWATER MARSH
The riparian forest floods <i>two</i> times a day. The riparian forest connects to this body of water <i>Nisqually River</i> <i>(eventually Puget Sound)</i>	The water in the riparian forest is HIGH LOW <i>Depends on time of day</i>	Black cottonwood is a native plant of <i>Washington</i> 	Himalayan blackberry is a  NATIVE NON-NATIVE plant.
Skunk cabbage grows in the <i>Riparian Forest</i> It smells  <i>stinky, skunky,</i> <i>etc.</i>	Northern Harriers hunt for <i>voles</i> in the <i>grassland</i> habitat. 	Voles live in the <i>grassland</i> habitat They eat <i>seeds, grass,</i> <i>mushrooms</i>	I spotted a <i>duck, cattail, deer, mink,</i> <i>frog, snake, etc.</i> in freshwater marsh.
Cattail grows in the  <i>Freshwater</i> <i>Marsh</i>	Many species of salmon are ENDANGERED THREATENED <i>Could be both, many salmon species are endangered and threatened.</i>	In the grassland, I found DUCKS HAWKS GEESE WIDGEONS	I can keep the Refuge habitats healthy and clean by: <i>reducing, reusing,</i> <i>recycling; not dumping</i> <i>down storm drains;</i> <i>picking up litter; learning</i> <i>and teaching others; etc.</i>

Habitat of the Riparian Forest



Directions: Draw a picture of the riparian forest habitat at Nisqually Refuge. Circle all of the plants and animals you could find evidence of being present. Write any plants or animals not on this list in the space provided at the bottom of this page.

Plants

black cottonwood
big leaf maple
red alder
Oregon ash
skunk cabbage
scouring rush (horse tail)
salmonberry
licorice fern
lady fern
moss

Birds

woodpeckers
rufous hummingbird
yellow-rumped warbler
great horned owl
common flicker

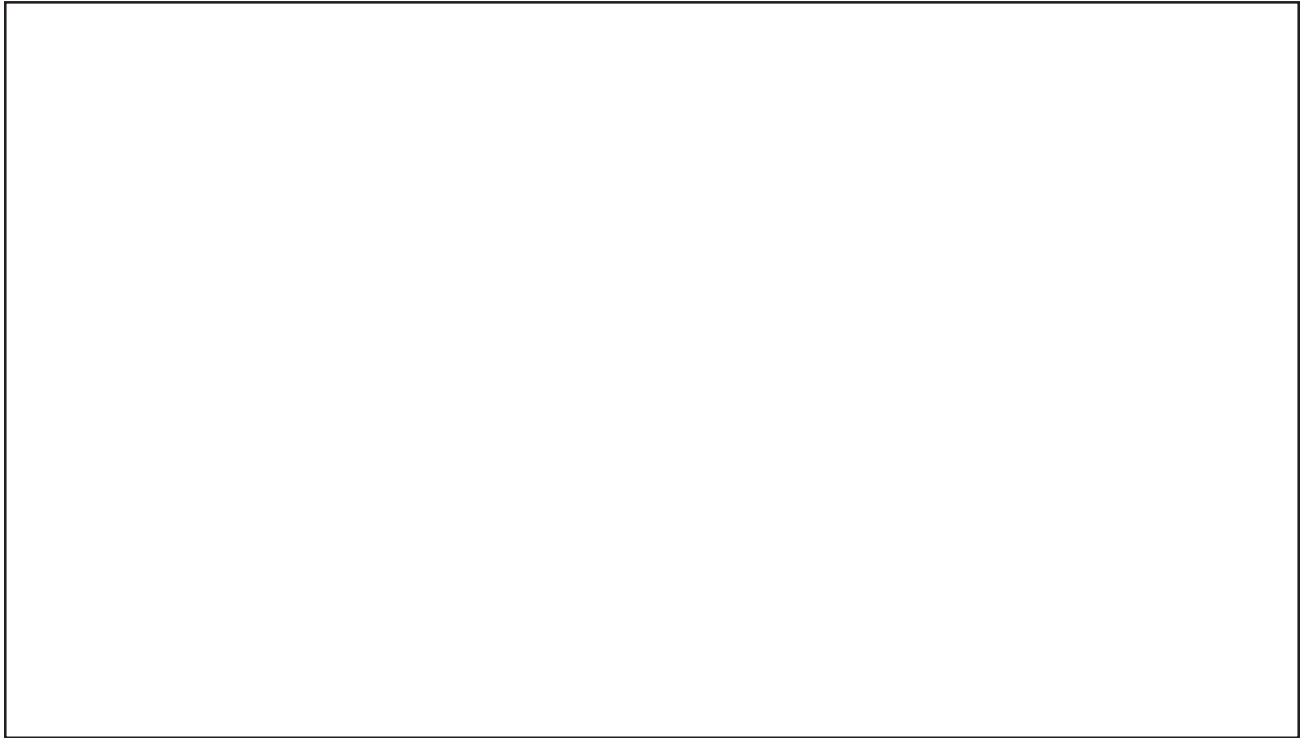
Reptiles/Amphibians

rough skinned newt
frogs (Pacific tree or red-legged)
garter snakes

Mammals

squirrel
raccoon
moles
beaver

Habitat of the Woodland Forest



Directions: Draw a picture of the woodland forest habitat at Nisqually Refuge. Circle all of the plants and animals you could find evidence of being present. Write any plants or animals not on this list in the space provided at the bottom of this page.

Plants

black cottonwood	nettles
big leaf maple	poison hemlock
red alder	willow
Oregon ash	jewelweed
Himalayan blackberry	snowberry
English ivy	velvet grass

Birds

woodpeckers
swallows
great horned owl
barn owl

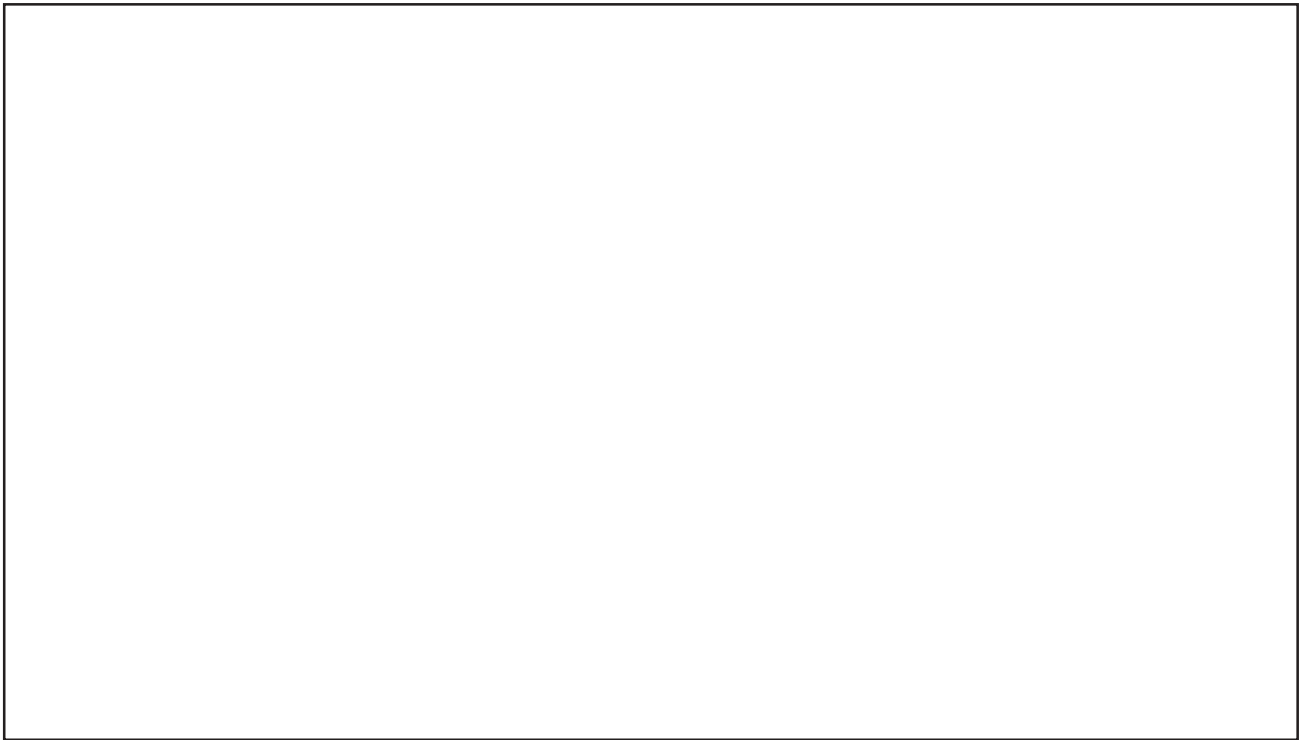
Mammals

squirrel
raccoon
moles
deer

Reptiles/Amphibians

frogs (Pacific tree or red-legged)
garter snakes

Habitat of the River



Directions: Draw a picture of the river habitat at Nisqually Refuge. Circle all of the plants and animals you could find evidence of being present. Write any plants or animals not on this list in the space provided at the bottom of this page.

Plants

black cottonwood
big leaf maple
red alder
Oregon ash
willow

Birds

great blue heron
belted kingfisher
double-crested cormorant
common merganser
mallard

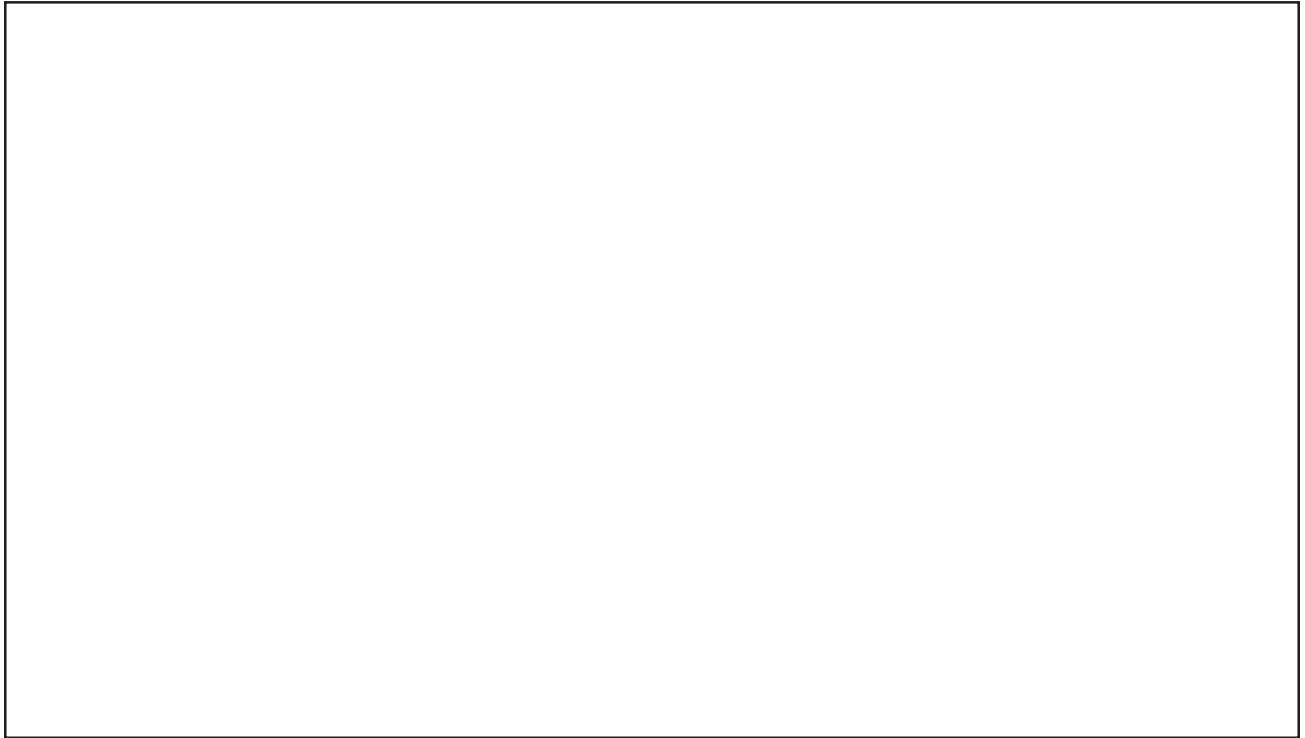
Mammals

river otter
seal
beaver

Fish

trout
steelhead
salmon (coho, pink,
chum and Chinook)

Habitat of the Grassland



Directions: Draw a picture of the grassland habitat at Nisqually Refuge. Circle all of the plants and animals you could find evidence of being present. Write any plants or animals not on this list in the space provided at the bottom of this page.

Plants

creeping bentgrass
reed canary
velvet grass
black medic
Canada thistle
quackgrass

Birds

red-tailed hawk
Northern harrier
Canada geese
American widgeon
mallard
great blue heron

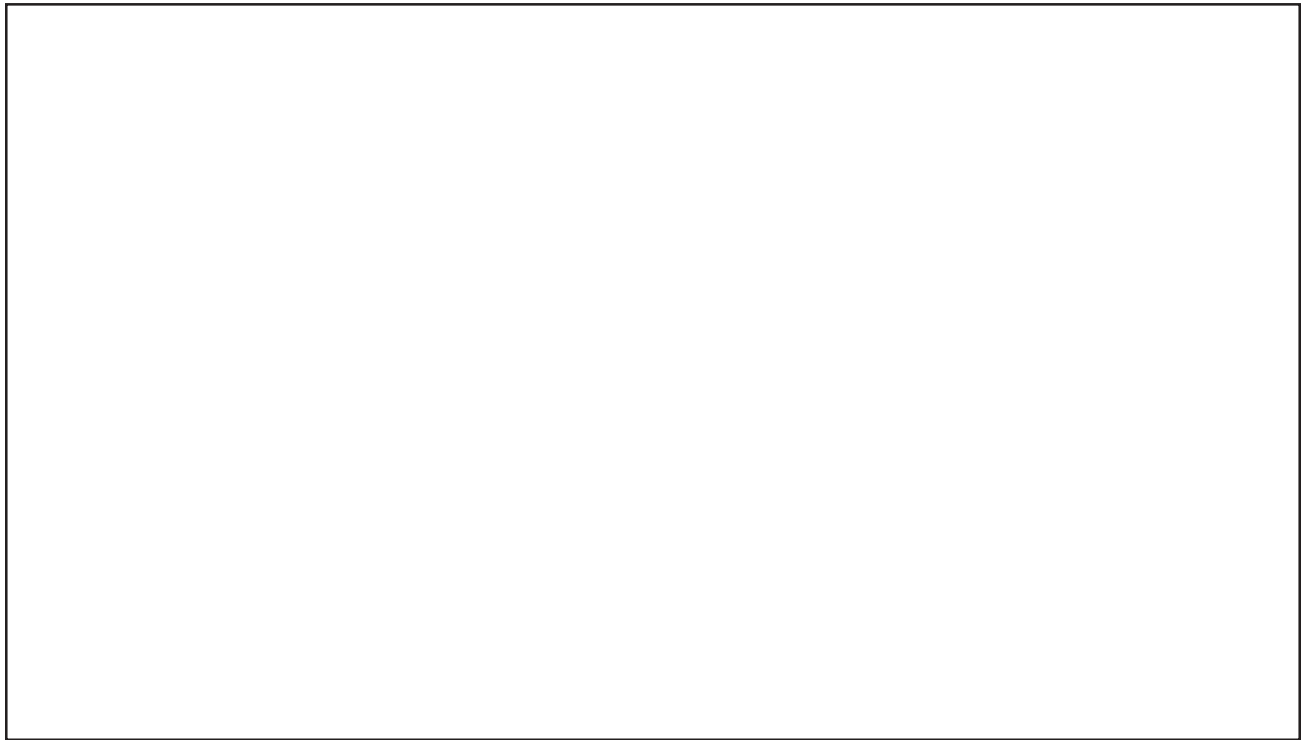
Mammals

voles
moles
deer mice

Amphibians/Reptiles

garter snake

Habitat of the Freshwater Marsh



Directions: Draw a picture of the freshwater marsh habitat at Nisqually Refuge. Circle all of the plants and animals you could find evidence of being present. Write any plants or animals not on this list in the space provided at the bottom of this page.

Plants

Pacific willow
red elderberry
crab apple
cattail
nightshade
duckweed
reed canarygrass
nettles

Birds

mallard
marsh wren
American bittern
green-winged teal
red-winged blackbird

Mammals

deer
mink
weasel
river otter

Amphibians/Reptiles

Pacific tree frog
red-legged frog
bullfrog

Mini-Expedition

Overview

Students will conduct an in-depth study of one of the Refuge habitats using role cards and recording data.

Duration

20-30 minutes

Grades

2-8

Subject

Science

Objectives

While exploring a microhabitat students will:

- make and record observations.
- draw conclusions about the observations.

Materials:

- make copies of data sheets, plus one extra blank sheet for each group.
- plant identification book (optional)
- insect/animal identification book (optional)

Arrange to check out mini-expedition packs from the Nisqually NWR Education Coordinator when planning your trip. Each pack has enough items for 3 students: 3-foot long piece of yarn or string for each group, 3 hand lenses per group, 3 small insect boxes, a mini-expedition role card set (limit 30 students at a time).

Essential Academic

Learning Requirements

Reading 1.1, 1.2, 1.3, 2.1, 2.2, 3.2; Communication 1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3; Math 4.1, 4.2, 4.3; Science 1.1, 1.2, 2.1, 2.2, 3.1; Geography 2.1

Arrange to check out mini-expedition packs from the Nisqually NWR Education Coordinator when planning your trip.

Background

Nisqually National Wildlife Refuge has eight different habitats within its boundaries: riparian forest, woodland, shrub, river, grassland, freshwater marsh, estuary and mud flats. (Review Habitats of the Refuge pg. 11-16). Each habitat can be studied in detail by investigating only a small section of it. The plants and animals observed, represent the living organisms one would expect to see in that habitat.

Activity

Tell the students that they are going on an expedition to explore unknown territory. As you walk the Twin Barns Loop Trail there are 3 sites (see map, next page) to use for this activity. Choose one from the map provided and stop at the area marked on the map. Brown signs mark these areas as "environmental study area."

Divide students into groups of three and hand out the role cards (one card per group). Familiarize the students with the roles of the expedition leader, the botanist, and the zoologist by having one of each read the card out loud. After students understand their roles, allow them 15-20 minutes for the expedition; give them boundaries to stay within.

Each group should put their string out in a circle to define their territory. The habitat they are observing is within the area of the string. Tell them to answer the questions on their cards and remember their answers for sharing at the end of the activity. If a data sheet is provided, go over it with them and monitor their progress. During the expedition hand lenses will enable them to see the plants and animals in detail.

Discussion

After the expedition, gather students together in a circle to share their discoveries. As a group, answer the questions on the role cards or review the data sheets. Then go around the circle and ask each student to share something that he/she learned about or saw. What was most interesting?

Count how many different plants and animals were found.

Mini-Expedition Role Cards

Expedition Leader

A scientist who finds and describes the study area

- *Mark the boundaries of the habitat with the string.*
- *Where do the plants and animals here find food, water and shelter?*
- *Describe the soil. Is it coarse, medium or fine?*
- *Is the soil moist or dry? Warm or cold? What can live in this soil?*
- *How much sunlight hits your habitat? How is this sunlight and shade used by the plants and animals?*

Botanist

A scientist who studies plants

- *Describe the plants in this habitat. Are they fuzzy, smooth, succulent (full of water), etc.?*
- *Describe the size, color and shape of their leaves and flowers.*
- *What makes them different from each other?*
- *How have they adapted to their habitat?*

Zoologist

A scientist who studies animals

- *Describe animals you find by color, size, shape and body parts.*
- *Look for signs of animals who live here (scat, tracks, holes, webs...)*
- *Name all animals that appear to live here.*
- *Describe the food chain for each animal. What do they eat? Who eats them?*
- *Where do the animals find water and shelter?*

Mini-Expedition Data Sheets

Expedition Leader

1. What type of habitat did you study? *marsh grassland woodland combination*
2. Soil texture: *coarse medium fine*
Soil Moisture: *wet moist damp cool*
The soil is (*cooler warmer*) than the air.
Soil color: _____ Are layers visible? _____
3. Sunlight: percentage of sunlight hitting ground: _____%
4. How is sunlight used by plants? _____
5. What kind of tracks and textures (mud cracks) can be found in the soil?
Who do you think made the tracks? Draw them on the back of your data sheet.

Botanist

1. How do plants get their food? _____
2. Draw and describe the plants in your study area. Record their features – size, color, shape of leaves and flowers (fuzzy, smooth, woody, waxy, etc.)
3. How are the plants you found adapted to living in this habitat? _____

Zoologist

1. Draw and describe the animals in your study area. Record special features (specialized mouth parts, camouflage, protective parts, color, size, shape).
2. Draw and describe any animal signs in your study area (scat, tracts, holes, etc.).
3. What is the food chain for each animal? _____
4. Why is this habitat ideal for the animals listed above?

Wild Words: A Journal Activity

Overview

Students make journals and go into an outdoor setting to write in their journals. Pick a spot with benches along a trail, platform or Visitor Center deck for this activity.

Duration

15 minutes classroom prep,
20–30 minutes at Refuge

Grade

K–12

Subjects

Language Arts, Science,
Communication

Key Concept

Naturalists use journals to record observations about the natural world. These observations take many forms, from writing to sketches, and can teach others about the environment.

Objectives

Students will be able to:

- observe and describe their surroundings, particularly in outdoor settings.
- record their observations and descriptions in a written and visual form.

Materials

- construction paper for journal covers
- unlined white paper for inside
- stapler and staples
- marking pens, crayons and pencils
- grades K–3: copies of Sensory Observation sheet (pg. 107) for each student

Essential Academic

Learning Requirements

Writing 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.1, 3.2; Communication 1.1, 1.2, 2.1, 2.2, 2.3, 2.4; Science 1.2, 1.3, 2.1; Art 1.1, 1.2, 1.3, 2.1, 3.1, 4.1.

Background

A naturalist is a person who studies nature, especially by direct observation of plants, animals and their environments. Naturalists often spend a lot of time in the outdoors, and they record their observations in some form – from sketches, drawings, paintings and photos to poetry and prose. Many famous naturalists have captured insights and observations of the natural environment, including Henry David Thoreau, Walt Whitman, Enos Mills, John Muir, Edward Abbey and Annie Dillard.

Most naturalists carry small journals with them when walking through various natural environments. The major purpose of this activity is for students to make their own journals, and to acquire experience in using a journal to record their observations in an outdoor setting.

In Classroom (15 min)

Get out construction paper and white paper for students to make their own journals. Simply fold the paper in half with the construction paper on the outside and white paper inside. Staple along seams so that the booklet stays together. Provide marking pens and crayons so students can put their name and drawings on the cover. In case of rain, you may want to consider providing clear plastic cover sheets for the top. Or, make or buy more durable journals before using them.

At Refuge (20 min)

Begin the hike, stop at a spot with benches or use the deck at the Visitor Center.

Ask

Have students sit quietly, listening carefully for any sounds. Ask them to look with 'soft eyes' that do not focus on any one thing, but broadly sense the whole environment. 'Hard eyes' are good for seeing a duck eating plants; 'soft eyes' are good for seeing all the area – the trees, sky, a squirrel out of the corner of one eye. Encourage students to use both 'hard' and 'soft' eyes to notice the difference in what they see and feel. Both are useful for recording observations.

Adapted from "Wild Words," *Project WILD* and "Stream Sense," *Project WET*.

Do

Have students close their eyes and visualize using a guided imagery or read one of the excerpts below. This will enhance their awareness of the outdoor setting.

Read

One of the following, or create your own:

(guided imagery) *"You are a tall tree standing in the forest. Feel your roots digging deep into the soil. Feel the water from a recent rainstorm seeping into the earth around you. Feel that large rock tangled in your roots. Feel your branches swaying in the breeze, warmed by the sunlight."*

(Excerpt from *The Wilderness World of John Muir*) *"It occurred to me that it would be a fine thing to climb one of the trees to obtain a wider outlook... Under the circumstances, the choice of a tree was a serious matter... Being accustomed to climb trees in making botanical studies, I experienced no difficulty in reaching the top of this one, and never before did I enjoy so noble an exhilaration of motion. The slender tops fairly flapped and swished in the passionate torrent, round and round, tracing indescribable combinations of vertical and horizontal curves, while I clung with muscles firm braced, like a bobolink on a reed."*

Do

Give the students at least 15 minutes to start getting accustomed to using their journal. Have each student find a quiet place to make a drawing of something they see. They could begin to write a few words of description, or a poem about their feelings in being outside in that place at that time. It is important to stress that the journal is theirs to fill with whatever they choose. However, it is not the same thing as a diary that might be written in every day. The journal is a special way to keep memories and ideas about things in the natural environment.

K-3 Adaptation

Use the sensory observation sheet (pg. 107) to aid younger students in describing the environment around them. Have them fill out at least two descriptions of how the area feels, looks, smells and sounds.

Discuss

Discuss the value of journals. In addition to recording impressions, feelings and observations, a journal can become an important log of data to be referred to later. It can reflect changes in ecosystems, vegetative types, animal populations and attitudes about things. It can hold images as well as words.

Extensions ("Animal Poetry")

Do

Select an animal habitat. Have students find a spot within that habitat.

Read

"Choose an animal you have seen today. Find the perspective of that animal's habitat. If it is in the sky look up. If it is on the ground, lie close to it. Do not damage the habitat. In your journals write one word that describes the animal you have chosen to be. On the next line write two words that describe what you look like. On the next line write three words that describe how you move, or where you live. On the next line write two words about how you contribute to the ecosystem where you live, or how you live. On the last line, write another word that describes who you are."

Example

Bird

Large, Strong





Soaring, Diving, Twisting

Predator, Hunter

Red-Tail

Sensory Observation Sheet

List at least 3 items for each sense

Sights	Sounds
	
Smells	Feel
	<p>Beware Poisonous Plants! Check with your teacher before touching plants.</p> 

Scavenger Hike: Can You Find It?

Overview

This activity allows students to use a scavenger hunt to become more aware of their surroundings and develop observation skills.

Duration

30 minutes to 1 1/2 hours

Grades

K-8

Subjects

Science, language arts, social studies

Objectives

Students will be able to:

- recognize and identify wildlife, plants and evidence of wildlife in different habitats.
- demonstrate that humans do not have exclusive use of environments.
- generalize that wildlife can be around us even if we do not actually see or hear it.

Materials

- pencil
- copy of one of Scavenger Hike worksheets
- hand lens (optional)
- binoculars (optional)

Essential Academic

Learning Requirements:

Reading 3.2; Science 1.1, 1.2, 2.1, 3.1; Geography 2.3; Art 2.1

Background

The major purpose of this activity is for students to understand and recognize wildlife, plants and their habitats. By investigating habitats on the Refuge, the students should be encouraged to generalize from the information they acquire to the whole of the planet, coming to terms that wildlife exists in all areas of the planet, in some form. In the deserts of the southern hemisphere, the oceans, tropical jungles, and cities of the earth; from the Antarctic snow fields to the glaciers of the Arctic region, wildlife exists in a variety of forms.

Method

The students will be given a list of things to find on the trails. Once on the trails, students, either individually or in groups, will identify different kinds of wildlife, plants and evidence of wildlife. A few sample scavenger hunt sheets are provided. Choose one of these for students to use, or create your own! Before starting your scavenger hike, make sure instructions are clear. Talk with students about what wildlife is and go through the list to make sure they have an understanding of what they will be looking for.

Discussion

Ask students to report on some of the most interesting things they found.

Adapted from "Microtrek Scavenger Hunt," Project WILD

Scavenger Hike

List examples or sketch at least one of each of the following:

BIRDS _____

ANIMALS _____

A LEAF FROM A TREE _____

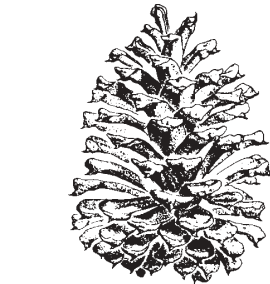
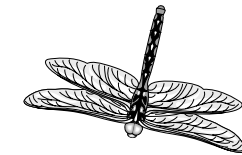
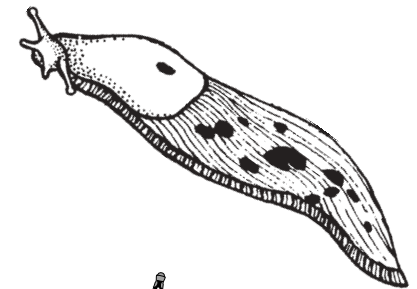
SOMETHING ROUGH _____

SOMETHING GREEN _____

INSECTS _____

NUTS OR BERRIES _____

ANIMAL TRACKS _____



Adapted from worksheets provided by local teachers.

Scavenger Hike

Look for evidence of wildlife!

CAUTION: Be careful not to damage animals or their homes!
How many of the following can you find? Check which ones you found.



BIG LEAF MAPLE _____

MALLARD _____



STINGING NETTLES _____

WOOD DUCK _____



CATTAIL _____

MINK _____



RED-TAILED HAWK _____

BEAVER _____



WOODPECKER _____

FROG _____



CANADA GOOSE _____

Find evidence that:

1) Wildlife is all around us,
even if we don't see or hear it.



NORTHERN HARRIER _____

2) Wildlife ranges from small in
size, to very big.



GREAT BLUE HERON _____



BITTERSWEET NIGHTSHADE _____

3) People and wildlife experience
some of the same problems.



SNOWBERRIES _____

Adapted from worksheets provided by local teachers.

Scavenger Hike

In writing and drawings, describe the following:

Two species of plants **with** berries. What color are the berries?

1)

2)

Three species of plants **without** berries:

1)

2)

3)

Evidence of two insect species:

1)

2)

Adapted from worksheets provided by local teachers.

Evidence of mammals (*not humans*):

Two types of grasses:

1)

2)

Describe and sketch one thing and include its surroundings:

Describe and sketch one thing in detail:

Where the River Meets the Sound



Post-Field Trip Activities

Sharing Circle/Fill in the Blank

Holding a Town Meeting

Watershed Watchers

Wetland Metaphors

More Field Trip Follow Up Ideas

Evaluation of the Educator's Guide

Evaluation of Refuge's Environmental Education Program

"In the end, we conserve only what we love.
We will love only what we understand.
We will understand only what we are taught."

— Baba Dioum

Sharing Circle

Overview/Objective: The following activities will encourage further learning about Nisqually National Wildlife Refuge and solidify concepts learned at the Refuge.

Grades: K-6

Method

This is appropriate for the end of the day of your field trip. Have students gather in a circle and share something that they learned or observed during the field trip. This could also be done on the bus going back to school. Some sentence starters could include:

The Nisqually Refuge was interesting to me because _____

My favorite activity today was _____

One thing I learned today was _____

Fill in the Blank

Overview/Objective: The following activities will encourage further learning about Nisqually National Wildlife Refuge and solidify concepts learned at the Refuge.

Grades: 3-6

Method

Have small groups of students write sentences that include special words (or vocabulary words) relating to the field trip. Each group, one at a time, writes a few of their sentences on the board with a _____ instead of the special word. The other groups try to figure out the missing word to complete the sentence. Repeat this until all groups have had a chance to put their sentences on the board.

Note: The word games work best with words from the glossary

Holding a Town Meeting

Overview

Students will hold a mock town meeting to decide how a piece of land should be used.

Duration

30-45 minutes

Grades

4-8

Objective

Students will:

- gain knowledge of how conflicting interests shape public policy by participating in a town meeting.

Materials

- identification cards for each presenter
- a permit for the city council to hold (provided by teacher)

Essential Academic

Learning Requirements

Reading 3.1; Communication 1.1, 1.2, 2.2, 2.3, 2.4, 2.5, 3.1, 3.3; Social Studies: History 3.3; Civics 1.3, 2.1, 2.2, 4.1, 4.2, 4.3; Economics 1.2, 1.4; Geography 3.1, 3.2, 3.3; *Extension:* History 2.1, 2.2, 2.3

*Adapted from "Habitat Fun Pack,"
U.S. Fish & Wildlife Service*

Method

Allow 15 to 30 minutes for the meeting and 15 minutes for discussion. Number identification cards for each presenter as you like; they will deliver their cases in that order. Each presenter may speak for 2 minutes; emphasize the power of a few, well-delivered sentences. Before the meeting begins read "Background Information for the Town Meeting." During the meeting, questions will be taken from the citizens. After the presentations, city council members will take a short break to make their decision. When the decision is announced, involve students in a discussion about this role-playing activity.

The Presenters

Barbara the Biologist

From the U.S. Fish & Wildlife Service

Dan the Developer

Comes in after meeting has begun; late plane

Mr. Bird

Represents the Bird Watchers' Society

Ms. History

From the Historical Society

Pam the Planner

From the town planning office

Pauline the Politician

Running for mayor

Sam the Sportsperson

Represents all those who hunt and fish in the marsh

Bob the Businessperson

Represents the local business community

City Council Members

Will decide the best use for the land, and will give the permit to Dan if the members (3) agree with the plan.

Citizens

Interested, happy and upset; they are full of questions

Timekeeper

To keep everyone short-winded - 2 minutes each

Extension (Grades 9-12)

Instead of using role-playing cards, have students research their roles and traditional views based on newspaper articles, journals and magazines in the library.

Background Information for the Town Meeting

Read to Your Class

"Mom and Dad are worried. Whenever there is a town meeting, it causes such a fuss that no one gets anything done for at least 3 days before and after it happens. The last open land area near town, the old marsh, might be sold. Fifteen acres of it would be sold to Dan the Developer for a shopping center, like the one on the other side of town.

Everyone around (your town) remembers growing up with the marsh nearby. It is a good place for a great adventure or two, even if Mom and Dad don't appreciate the bugs and worms you bring home. In the springtime you watch the mallards raise their young; in fall and winter you watch thousands of migrating ducks as they stopover to feed in the marsh and sloughs on their way south. You know how you can lose all track of time while watching the birds feeding in the marshes. The marsh is a great place.

It sure will be hard to see the old marsh go, but Mom said it would be good for business to have some new stores. Plus, you wouldn't have to ride your bike all the way into town; it would be a lot easier.

I wonder what will happen tonight at the town meeting? People want to know if Dan will get a permit to build on the marsh."

Discussion

At the end of this simulation activity, students should have an opportunity to step back from the role-playing situation to think about the following questions:

- 1) What additional information would have helped you plan your group's proposal?*
- 2) Where would you go to get this information?*
- 3) Were you assigned to a group you didn't want to represent? If so, how did you feel?*
(Point out that other people have different needs and ideas, and this might be a way to identify them.)

Encourage students to call developers and ask about their feelings on this issue. Call wetlands or environmental organizations for more information about developments.

Town Meeting Identification Cards

City Council Members

Remember city council members, you were elected by the people of the town to represent them - all of them.

You must listen carefully to all the speakers and people from the audience before you decide whether to grant the permit to Dan.

You might grant the permit only if some changes are made in the plans.

What would those changes be? If you give him the permit so the sale can go through, you had better be ready with good reasons why.

The town is waiting for your answer!

Sam the Sportsman

Remember Sam, you represent all of the people of the town who like to fish and hunt in the marsh.

Women and men interested in outdoor sports such as hunting and fishing want to protect natural areas where fish and wildlife live.

There are fewer and fewer places to go and enjoy these activities with your children or friends.

You want to save those places that are left!

Pauline the Politician

Remember Pauline, if you want to be elected mayor next year you had better start lining up the votes now!

How can you support both the shopping center and save the marsh? The shopping center would provide jobs for people, but destroying the marsh would make people like Mr. Bird and all of his birdwatcher friends vote for your opponent.

So, just think of a plan that will make Dan and the nature lovers happy. Now is the time to show this town what a leader you can be!

Bob the Businessperson

You represent local business people and you want the town to grow and prosper.

The shopping center would bring jobs and money into the town. You think it would be good for everyone.

You support Dan the Developer and want the shopping center to be built.

Town Meeting Identification Cards

Barbara the Biologist

Remember Barbara, you stand for the fish and wildlife. You represent creatures who cannot speak for themselves. Could the marsh area be left alone as a habitat for the birds?

The ducks use the sloughs in the winter when it is too cold to stay up north in Alaska or Canada. The curlew, killdeer and sandpipers love to hunt for food in the mud. The great blue heron hunt both in the marsh and the slough. Remind people that the marsh is a home for many other kinds of fish and wildlife. Long live the wildlife!

Mr. Bird

Remember Mr. Bird, your wonderful birds are in danger. As this year's president of the Bird Watchers' Society, it is up to you to save them! If Dan the Developer puts in that shopping center, not one bird will return to the area. All that habitat will be lost forever.

Not only are there very few areas left for the birds, there are very few places left for people to watch birds and enjoy nature and the outdoors. Hang in there for your birdwatcher friends and your feathered friends!

Dan the Developer

Remember Dan, you stand for all the investors from Seattle. They will put a lot of money into this project. They expect you to convince the people of the town, especially city council members, that the shopping center will provide jobs and better and easier shopping for the people.

The town has really grown. It needs a shopping center on the north side of town. You and your investors will all make a good profit if the shopping center is built. Go for it!

Ms. History

Remember Ms. History, you stand for all the old places that are left in this town; there aren't many left. The first family to settle in the area built their barn on the edge of that marsh, and it is still standing today. That barn is more than 100 years old and should be preserved in some way, not torn down.

Unfortunately, it is on the piece of land that may be sold to Dan the Developer. There is no way he is going to let the barn stand. Ms. History, fight for the past!

Town Meeting Identification Cards

Pam the Planner

Remember Pam, your job is to help find the best solution for all the citizens. The town could use the new jobs, but you also have to consider all of the new roads a shopping center will need. How will the town pay for them?

The town needs to clean up the river, and the marsh could be a natural water filter to remove silt and absorb pollutants. Does the marsh provide other benefits people are forgetting?

Is there a way to build the shopping center so that all of the marsh won't be lost? Pam, the council members want to know what you think, so think hard.

Timekeeper

Remember timekeeper, the folks at the town meeting are going to be excited.

It is your job to see that each of the eight speakers does not go over the time limit of 2 minutes each.

Questions from the audience should be short - about 20-30 seconds each.

City council members are counting on you to keep order tonight.

Good luck!

Watershed Watchers

Overview

Students will identify potential community action projects they can undertake to help protect or restore creeks, water quality or wetlands in the Puget Sound area.

Duration

Varies with each action project; can range from several 30-50 minute class periods to a major class project lasting a semester.

Grades

2-12

Key Concepts

Community participation helps students realize that their actions can help protect and restore Puget Sound habitats.

Objectives

Students will be able to:

- work as a group to plan and carry out a project that accomplishes their goal.
- protect and restore a local creek or improve water quality in the Puget Sound or help protect and restore wetland habitats.

Essential Academic

Learning Requirements

Communication 3.1, 3.2, 3.3; Geography 3.1, 3.2; Civics 4.1 (Depending on project choice, additional EALR's could cover Arts, History, Science or nearly any other subject area.)

Background

- Young people are often extremely concerned about the future of the environment and the protection of wildlife. Through community service or public education projects they can contribute significantly and tangibly to the protection of Puget Sound watershed, either through protection of water quality, of a wetland, or of a creek.
- A watershed is the region that drains into a body of water, such as the Puget Sound. The water cycle is at the heart of the watershed. Pacific Ocean water evaporates and forms clouds that travel inland. As the clouds rise over mountains, they are forced to rise and cool, causing rain or snow. The rain or melted snow that runs down the western slopes of the Cascade mountains flows into creeks or rivers that empty into Puget Sound.
- Clean water is critical for the survival of most living things on the earth. Unfortunately, water is often polluted by humans. In a watershed, water can be polluted at points far away from where the pollution harms habitats and wildlife.
- There are two types of water pollution: point sources and non-point source pollution.
- Point source pollution is focused at one point, such as a water pollution control plant or an industry along the Sound.
- Non-point source pollution is also known as runoff, and includes the water that runs off the surrounding land into the Sound, such as agricultural runoff. Runoff often travels through storm drains picking up additional pollution such as motor oil or pesticides, from roadways.
- Many individuals and organizations are working to educate others on how to prevent water pollution.
- The best way to prevent pollution is at the source: using alternatives to toxics and preventing toxics from entering watersheds.
- Creeks and streams of Puget Sound watershed are valuable and fragile ecosystems.

Adapted from "Watershed Watchers,"
Salt Marsh Manual

- One of their main values is that they provide habitat for a great variety of plants and wildlife. Particularly within urban areas, creeks and streams often provide a last remaining natural area that wildlife can use for food, water and shelter.
- Creeks and streams are fragile because their health is easily destroyed through human actions.
- The things that most threaten their health and the plants and wildlife that depend on them are: dumping garbage, eroding stream banks, water pollution from businesses, individuals that illegally dump down storm drains, removal of streamside trees and plants, water running off streets when it rains and carrying pollution into creeks and streams, and constructing buildings or roads too close to creeks and streams.
- Wetlands around the Sound are at the base of the watershed.
- Puget Sound wetlands filter sediments and pollution, control floods, provide habitat for plants and animals, including two endangered species, and provide nesting and feeding stops for migratory birds.
- Seventy-five percent of Puget Sound wetland habitats have been lost to development.
- The things that most threaten the health of wetlands and the wildlife that depend on them are: water pollution from streams and storm drains that flow into wetlands, garbage dumping, nonnative plant species crowding out native wetland plants, and development upon wetlands.

Method

Introduction

Review the questions below with students before choosing a class project.

"What is a watershed?"

(A watershed is the region that drains into a body of water, such as the Puget Sound. Rivers and creeks carry rainwater, melting snow, and treated water from water pollution controls plants through the Sound and Delta toward the Pacific Ocean. Once pollution enters a watershed, it affects the health of its creeks, streams and wetlands.)

"What are some way that humans harm the water quality of a watershed - its creeks, streams, rivers, bays and ocean?"

(By dumping hazardous materials, such as paint or pesticide sprays into storm drains, illegal dumping into creeks, oil spills, sediment from eroding creek banks, industries dumping into waterways, etc. Anything that goes down the storm drain runs directly to creeks and streams and ultimately, to the Sound.)

"Does anyone know of any nearby creeks or streams of their watershed?"

"To which body of water do our local creeks run?"

(Most rivers, creeks and streams flow into Puget Sound and then to the Pacific Ocean, but some on the coast may flow directly to the ocean. Check a map to make sure.)

"What are some ways that creeks and streams are polluted?"

(Pollution, such as motor oil, soapy water, or pesticides, that go down storm drains, littering, illegal dumping of pollution or garbage, soil erosion.)

"How does erosion sediment damage creeks and the Sound?"

(Erosion causes sediment to wash into creeks and to the Sound. Sediment can clog fish gills, bury good salmon spawning grounds, and harm filter feeders, such as clams and mussels.)

"How do we cause erosion of creek banks?"

(Removal of plants from creek banks – by clearcut logging, riding bikes along creek banks, sliding down creek banks, and walking off approved creek trails.)

"What are some ways that wetlands are destroyed around the Sound?"

(Diking for farming, dredging for ports, or filling for development such as buildings, roads, airports or landfills have destroyed many of the wetlands in the area.)

"Once pollution enters the Sound, it affects the health of wetlands. What percentage of wetlands still exist around the Sound?"

(Less than 25%.)

"Why are wetlands around the Puget Sound important?"

(They are a home for plants and animals, endangered species, such as the peregrine falcon are dependent upon wetlands, migratory birds use wetlands, wetlands filter pollutants and sediment, wetlands provide flood control.)

"What are some ways that you can help protect Puget Sound watershed?"

"What projects would you want to do to help the Sound?"

"How could you help creeks and streams that flow to the Sound?"

"How could you protect water quality in the Sound?"

"How could you protect wetlands in Puget Sound?"

Select a Class Project

Brainstorm with students different ideas for their class project. Below are some ideas and resources on how students can protect water quality of the watersheds of Puget Sound. These ideas may surface during the discussion or you may want to contribute them. Through discussion, help the students identify one or two projects that they can actually carry out. Choose projects appropriate for your students organizational ability and skill levels.

As a group, develop a written plan for the project. Include a schedule showing who is responsible for what and in what time frame. During this planning phase be sure to identify the type of help needed from parents, community groups, natural resource agencies, and others.

Conduct Field Work for the Project

Carry out as much of the project as possible. Encourage the students to follow the project through to completion. Make arrangements for completing any work the students cannot accomplish.

Post Project Activities

Talk about successes or shortcomings of the finished project. A few weeks after the project is completed, have several students arrange to visit the site where work was done or displayed to determine if any follow-up is required. Provide recognition for the group's good work, perhaps through media attention, a trip, a party, a presentation of "thank you" from the recipient group with press coverage, etc.

It may be wiser to start with something small that can be finished with great success than with a large project that might be beyond the students' reach. Check with organizations listed at the end for more information about potential projects.

Project Ideas

Water Quality Protection

- Create a display mural, window painting, or posters somewhere in your community, such as the windows or lobbies of local businesses or public buildings, illustrating the importance of clean water and ways in which water becomes polluted.
- Educate others about the dangers of dumping anything into storm drains; develop a community service project in which you work with the city for ways of labeling storm drains with warning signs. Check the Public Works department of your local city.
- Contact government or environmental organizations, such as the Sierra Club, U.S. Forest Service, or environmental groups in your community to see if your class can help on a freshwater habitat restoration project.

Creek and Stream Protection

- Organize a creek cleanup. (Gain permission from landowners or park officials. Check with the city water resources division or local Stream Team. Gather materials you will need such as gloves and garbage bags. Discuss safety considerations. Arrange for someone to haul away the garbage collected.)
- "Adopt" a creek, stream or watershed in your community by visiting it regularly and helping monitor and maintain its health. Keep it clean of litter and pollution, conduct water testing to check its health, report water pollution, involve neighbors to help with your project, etc.

- Participate in a creek habitat restoration project, such as revegetation, irrigation, weeding or cleanup, that is managed by an environmental, state or local organization. Contact your local Stream Team, The Nature Conservancy of Washington, or your local city or county public works department on projects that may be occurring locally.

Wetland Watchers

- Develop a 3 R's (reducing, reusing and recycling) program in your classroom or school. Note: It is estimated that education facilities produce 240 pounds of waste per student per school year! Students can attempt to produce no waste for a week. Record the methods used to reduce garbage. Some ideas include: Use the back sides of waste paper for notes or copies, make double-sided copies, buy products that use recycled materials, such as recycled packaging and paper, pack lunch in reusable containers, reuse plastic and paper bags several times, avoid disposable silverware and plates, and recycle!
- Become involved in a community group that works to enhance and protect a local Puget Sound wetland (People for Puget Sound, etc.)
- Adopt-a-wetland (cleanup litter, watch wildlife, monitor the area over time, and educate others about its value).
- Be watchful citizens, report any action that degrades Puget Sound wetlands. (Call the Environmental Protection Agency or Washington State Department of Ecology.)

Resources for Community Projects

For curriculum-based action projects...

Nisqually River Education Project
PO Box 1076
Yelm, WA 98597
(360) 459-6780

Nisqually Stream Stewards
Nisqually Tribe Natural Resources
12501 Yelm Hwy SE
Olympia WA 98513
(360) 438-8687

Nisqually Reach Nature Center
4949 D'Milluhr Rd NE
Olympia, WA 98516
(360) 459-0387

Nisqually River Basin Land Trust
PO Box 1148
Yelm, WA 98597
(360) 923-1808

For creek restoration, stream monitoring, storm drain stenciling and site cleanups...

Olympia Stream Team
(360) 753-8454

Lacey Stream Team
(360) 438-2687

Thurston County Stream Team
(360) 754-4681

Tumwater Stream Team
(360) 754-4140

South Sound GREEN
(360) 753-8365

Native Plant Salvage Project
(360) 704-7785

Nisqually Stream Stewards
(360) 438-8687

Pierce County Stream Team
(253) 845-2973

South Puget Sound Salmon Enhancement Group
(253) 984-0431

Other miscellaneous projects and educational programs...

Thurston Conservation District
(360) 754-3588

Pierce Conservation District
(253) 845-9770

Thurston County Community & Environmental Programs
(360) 754-4111

Pierce County Environmental Services
(253) 798-4139

WSU Cooperative Ext - Pierce Co
(253) 798-3257

WSU Cooperative Ext - Thurston Co
(360) 786-5445

Thurston County Solid Waste
(360) 786-5136

WA Dept. of Fish & Wildlife
(Wildlife & Endangered Species Projects)
(360) 902-8306 or (360) 902-9309

People for Puget Sound
(360) 754-9177

Tacoma Nature Center
(253) 591-6439

YMCA Earth Service Corps
(360) 357-6609

Black Hills Audubon
(360) 352-7299

Washington State Audubon
(360) 786-8020

Wetland Metaphors

Overview

Students will determine and describe how various household objects are metaphors for the beneficial functions of wetlands.

Duration

30 minutes

Grades

K-6

Key Concept

Wetlands perform a variety of functions, and serve as a valuable habitat for wildlife and humans.

Objectives

Students will be able to:

- describe characteristics of wetlands.
- describe the importance of wetlands to wildlife and humans.

Materials

- small pillow
- eggbeater
- sieve or strainer
- sponge
- antacid tablet
- paper coffee filter
- small box of cereal or rice
- doll cradle or nursery item
- picture of hotel posted on 3x5 card
- box to hold all these items

Essential Academic Learning Requirements

Reading 1.1, 1.2;
Communication 3.1, 3.2, 3.3;
Science 1.2, 2.1, Geography 3.1, 3.2

Background

The words in parentheses indicate the metaphorical object. All wetlands, whether coastal or inland, provide special habitats that affect wildlife far beyond their boundaries. They are uniquely important to plants, animals, humans, and the total environment.

- Because of the abundance of food (*cereal*) and plant cover which serves as shelter, wetlands are rich with wildlife.
- Both coastal and inland marshes provide breeding, resting and wintering habitats for thousands of migratory birds (*cradle, pillow, hotel picture*), including ducks, herons and shorebirds.
- Many species of fish (including bass, salmon and perch) important for commercial human consumption reproduce and spend part of their lives in wetlands close to larger bodies of water (*cradle*).

Wetlands also have the unique ability to purify the environment.

- They can trap and neutralize sewage waste (*filter, antacid*), allow silt to settle, and help decompose many toxic substances.
- Wetland plants are highly valuable. Plants absorb nutrients and cycle them through the food web. They slow down water flow, causing silt to settle out that might clog waterways (*strainer*). Plant photosynthesis adds oxygen to the environment and plants provide food for other life.

Wetlands are extremely important in flood control, holding back and absorbing excess rain water and allowing it to gradually drain away.

- During dry periods wetlands hold moisture long after open bodies of water have disappeared (*sponge*).

The many functions and activities that take place in wetlands make them among the most productive and valuable ecosystems in the world.

Adapted from "Wetland Metaphors,"
Salt Marsh Manual and Aquatic Project
Wild

Method

Prepare a "Metaphor Mystery Container" in a box. The outside of the container may be painted or decorated to look like a wetland. Fill it with the items on the materials list. The container should have an opening just large enough for a hand to reach through and retrieve the items.

Read

"We are going to use metaphors to show how important and beneficial wetlands are. A metaphor is an object or idea that can stand for another object or idea. When I say 'saving wetlands is the key to saving the endangered Chinook salmon,' I am using the word key as a metaphor to mean unlocking the door to the solution for saving the Chinook salmon. The metaphors we will use are common objects in this box that show the different functions of wetlands."

Grades 3-6

Divide the class into small groups. A representative from each group will choose an item from the "Metaphor Mystery Container." Each group must decide how the object represents what a wetland is or does. Allow time for discussion and then have each group present their object and explanation.

Grades K-2

Hold up each item and allow time for discussion about how it relates to wetlands.

Discussion

Notice that through metaphors humans have a connection to wetlands. Are they beneficial to us as well as to wildlife? The survival of wetlands depends on what we decide to do with land.

More Field Trip Follow-up Ideas

- 1) Write or send drawings to elected officials or newspapers describing the trip, impressions and importance of the Refuge.
- 2) Do research reports on birds or wildlife of the Refuge.
- 3) Do research on current events, developments or environmental issues of the local area.
- 4) Write and read a story to the class. An example might be the first-person account of life as a Canada goose.
- 5) Recycle classroom trash, glass, paper and aluminum etc.
- 6) Design art projects and murals; draw a map or build a model of an animal you saw.

Evaluation of the Educator's Guide

Educator _____

Group _____

Grade Level _____

Date of Visit _____

Please return this evaluation to:

Nisqually National Wildlife Refuge

100 Brown Farm Rd NE

Olympia, WA 98516

The Educator's Guide to Nisqually National Wildlife Refuge was developed for use in planning field trips to Nisqually National Wildlife Refuge as well as classroom, outdoor and post-field trip activities. Your input on the guide will help us to continue to make improvements to it.

1) Please evaluate the guide on the following:

Appropriate to grade level	1 <i>No</i>	2	3	4	5 <i>Yes</i>
Usefulness	1 <i>Useless</i>	2	3	4	5 <i>Helpful</i>
Content	1 <i>Boring</i>	2	3	4	5 <i>Interesting</i>
Background Information	1 <i>Irrelevant</i>	2	3	4	5 <i>Helpful</i>
Presentation	1 <i>Unattractive/Unclear</i>	2	3	4	5 <i>Attractive/Clear</i>
Organization	1 <i>Hard to Use</i>	2	3	4	5 <i>Easy to Use</i>

2) Other comments, suggestions and ideas:

Evaluation of Refuge's Environmental Education Program

1) Overall Visit. What were your general impressions of your group's visit. Please consider organization, facilities, staff support in planning and scheduling, and educational value.

2) Outdoor and Classroom Activities. Please evaluate the activities in the Educator's Guide that you used.

<i>Activity title(s)</i>	<i>Grade level appropriate?</i>	<i>Easy to use?</i>	<i>Adequate background information?</i>	<i>Interesting to students?</i>	<i>Activity objectives met?</i>
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

3) Future Field Trips. What would you do differently or the same?

4) Ideas for the Staff. Indicate suggestions for equipment, facility improvement, lesson plan topics, curriculum materials, teaching aides, etc.

Thank You!!

Where the River Meets the Sound



Additional Resources

Nisqually Reach Nature Center

Glossary

Resources

Essential Academic Learning Requirements Chart

"Like winds and sunsets, wild things were taken for granted until progress began to do away with them. Now we face the question whether a still higher 'standard of living' is worth its cost in things natural, wild and free. For us of the minority, the opportunity to see geese is more important than television, and the chance to find a pasque-flower is a right as inalienable as free speech."

— Aldo Leopold

Where the River Meets the Sound

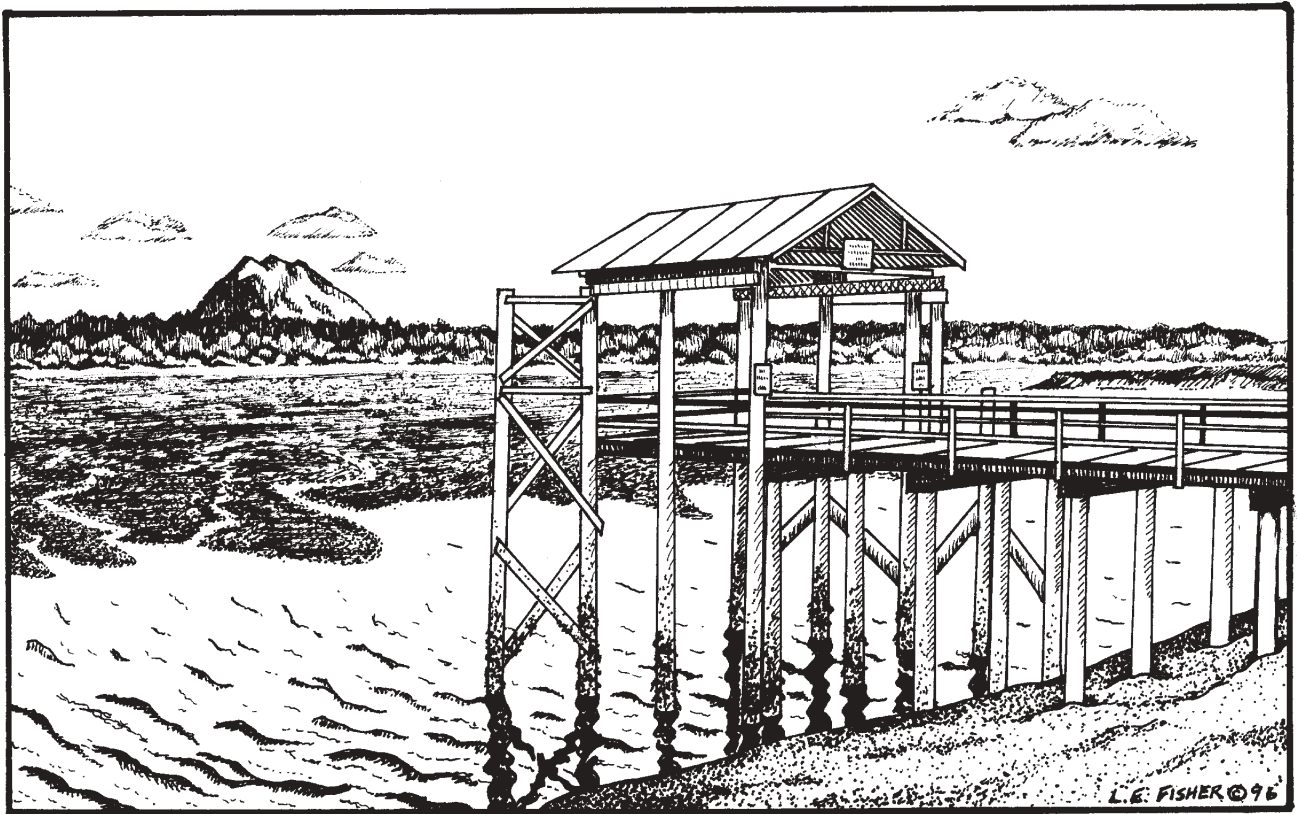


Nisqually Reach Nature Center

The following section was derived from a preliminary edition of this guide which focused on activities at Nisqually Reach Nature Center. The Center is located at Luhr Beach, on the Nisqually Delta, at the mouth of McAllister Creek. A non-profit organization operates the Center, which focuses on estuarine ecosystem education. For information on field trips or a more complete version of this section, contact the Nature Center at (360) 459-0387.

During your visit to the Nisqually Reach Nature Center, you have a number of options to choose from. Students may study the displays, explore the beach, use the binoculars and microscopes, receive an overview of the estuary (appropriate for most all visitors), do a plankton tow, and even fish. A staff member or the director will be involved to the extent you choose.

Generally some time will be given to allow students to investigate on their own. Your time here will match your plans for providing learning opportunities for students. Select activities that most suit you and your students' needs.



A view of the dock at Nisqually Reach Nature Center with Mount Rainier in the background.

Estuaries, What Are They?

Estuaries are amazing places where freshwater from rivers and streams enters bodies of saltwater. At Nisqually Reach both the Nisqually River and McAllister Creek reach Puget Sound. Here mudflats built by deposited river sediments join salt marshes. An abundance of nutrients available as food to plants and animals are found in this rich environment. From plankton to gray whales, this estuary is teeming with life. As freshwater from the rivers flow towards the saltwater of Puget Sound, it is mixed by the tides. Twice daily the tides reach high and low water levels. The daily high tides force the seawater up the lower stretches of the rivers and streams. During the lowest tides, the freshwater flows unrestricted to the Sound.

From early time, people have benefited from the rich resources found at the Nisqually Reach. Native Americans had fish camps located at the mouths of the streams and rivers to harvest salmon. Shellfish and crabs were gathered for food. Just as the Native Americans had discovered the wealth of this estuary, so too did the early settlers.

During the 1830's and 1840's, the Hudson Bay Company established Fort Nisqually and farmed the area between McAllister Creek and the Nisqually River. In the early 1900's, the delta was diked to create farmland. Farming continued until the early 1960's, when the property was put up for sale. During the 1950's, the Port of Olympia proposed to develop an industrial park at the delta. In the 1960's, the City of Seattle proposed the delta for a regional landfill and the Port of Tacoma sought to build a deepwater port. But through the efforts of hard-working, concerned individuals, the old farm was eventually purchased by the federal government for the Nisqually National Wildlife Refuge.

The site of the Nisqually Reach Nature Center was a boathouse in the early 1930's owned by Bill Luhr. Later he built five small beach cabins to accommodate fishermen. In 1970, the boathouse was sold to the Washington State Game Department, now the Washington Department of Fish & Wildlife. The Evergreen State College leased the facility and converted it into a science laboratory. When Evergreen no longer needed the lab, the Black Hills Audubon Society reopened it as an interpretive center in January, 1982. Now, the Nisqually Reach Nature Center operates as a center for estuarine ecosystem education.

Planning Your Visit

As early as possible, contact the Nisqually Reach Nature Center at (360) 459-0387 and request an Application/Confirmation Form. Complete it and return it by the date written on the form. If you have additional questions, please ask the Director.

When planning a field trip to Nisqually Reach, please consult a tide table. Extremely high tides prevent students from exploring the beach environment to any effective length. Tide tables are readily available at area sporting goods stores. This information can also be found in many newspapers.

Please remind your students they are visiting a beach reserved for nature study. They may pick up organisms to examine and study but must return them to their place. Our goal to have as small an impact on the the beach environment as possible.

Students should come dressed for prevailing weather conditions, rain or shine. If they have them, rubber knee boots are useful. Caution students to avoid getting too wet, Puget Sound is very cold. Students must be supervised by an adult at all times.

Directions to Nisqually Reach Nature Center

From Olympia and Lacey

Take Martin Way East toward the Nisqually River. Turn left (North) on Meridian Road NE and continue approximately 2 miles. Turn right on 46th Ave NE, go left on D'Milluhr Rd NE, follow several blocks to the Nature Center.

From Tacoma

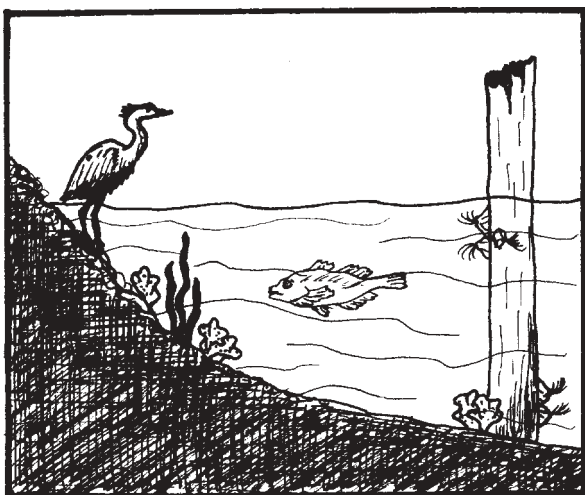
Take I-5 South to Exit #114 (Nisqually), continue straight on Martin Way. Turn right (North) on Meridian Road NE and continue approximately 2 miles. Turn right on 46th Ave NE, go left on D'Milluhr Rd NE. Follow D'Milluhr several blocks to the Nature Center.

Pre-Trip Activity

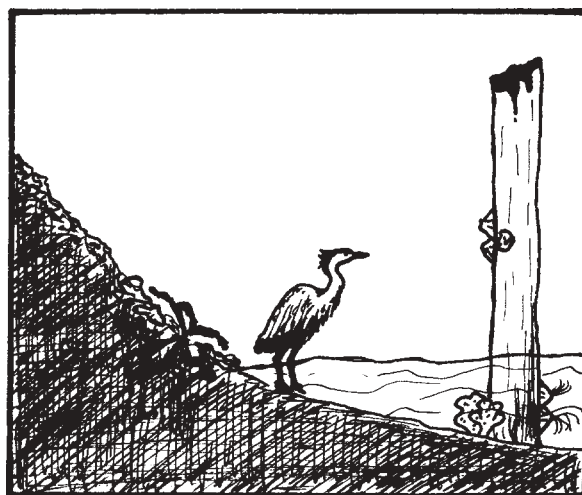
Perhaps the first place to begin preparing students for their visit is to locate the Nature Center site on the Nisqually River Basin Map. Next, locate their school on the map. Have them trace the path of the Nisqually River past their school to its mouth, and then the likely roads that will be used to transport them to the Nature Center.

The activities in this section will give students an opportunity to begin learning about the life of organisms here at the estuary and the uniqueness of the ecosystem. It is realized that the background, experiences and age of your students will determine how the activities may be used.

Also discuss with your class the fact they will be visiting the Sound and saltwater which is effected by tidal activity. Normally, there are two high tides and two low tides daily. What they see will depend upon the height of the tide during their visit. Using a tide table, have students predict whether they will visit during a high or low tide.



Estuarine ecosystem at high tide.



Estuarine ecosystem at low tide.

Beach Scavenger Hunt

Subject

Science

Materials

- copies of the Beach Scavenger Hunt sheet

Procedure

Students are to check off their observations, not collect specimens or samples. Please remind them to leave all treasures on the beach!

Beach Connections

Subjects

Language Arts
Reading
Science

Materials

- library reference books on marine organisms for pre-visit research
- copies of the Beach Connection Cards
- other materials (string, clothespins, etc.) provided at the Nature Center

Objective

Students will see connections and interrelationships between the living organisms and non-living structure of the beach.

Background

Nothing really lives all by itself. The plants and animals found here at the beach community depend on each other for food, shelter and space. The activity will involve all students in constructing a visual representation of the connections between organisms and the environment in which they live. String will be passed from one to another as components of the beach environment are linked together.

Procedure

- 1) Hand each student a Beach Connection Card and a clothespin to attach it to themselves. On the back of each card is a brief biography.
- 2) Form a circle. The "sun" starts with a ball of string symbolizing energy. They find a plant which captures light energy, enabling it to grow, and pass the string to reveal a connection. The plant then finds another connection and passes the string. Over time all the students can be drawn together forming a web. There is no predetermined order and anyone may receive the string more than once. Notice all structures and organisms are included.
- 4) Conclude by having the students recognize that everything exists as part of the beach community - there is a web of interrelationships. Ask, "What have you learned about this beach community?"

Life at the Beach

Subjects

Reading
Science

Materials

- set of the Beach Connection Cards
- 2 lengths of twine or light rope (one 30' long with a mark in the middle, the other 20' long)

Objective

The students will understand the effects of changing tides on the living and non-living components of a beach.

Background

Using the Beach Connections cards the students will construct a model of a beach in which the tides come in and then go out. You may wish to assign different cards for this activity so students will broaden their knowledge of marine life forms and how they fit into a beach ecosystem.

Procedure

- 1) Copy the cards in quantities needed to match the number of students and distribute one to each class member.
- 2) Have students take their cards to an open area. They will use clothespins to attach the Connection cards to the line.
- 3) Place the 30' line on sloping beach, one end toward the water and the other away. The section above the middle mark represents the gravel of the beach, and the section below the middle mark represents the sand and mud.
- 4) Two students take the 20' line and stretch it between them to represent the water line at low tide. Position them at the lower end of the sand and mud, intersecting the 30' line to form a "T".
- 5) Invite the pilings, gravel and sand to position themselves on the beach in appropriate places. Obviously, some organisms will live on, over or under the pilings, gravel or sand. Invite the other organisms, one at a time, to choose a place on the beach and join the tidal ecosystem. Have them explain why they selected the place, how they feed, and their special adaptations for living and eating.
- 6) Once all the components have joined, have the "tide" walk up the beach. As the water covers components of the beach and mobility for some is restored, have them explain what changes occur because of the incoming "tide".
- 7) Some of the organisms can exist throughout the beach ecosystem, while others are restricted to a specific place. The Great Blue Heron, for example, usually wades to feed, but only to the depth allowed by the length of its legs. Barnacles are widely dispersed over the beach and in pilings, but cannot attach themselves to sand and mud.

Beach Scavenger Hunt

Please remember to only observe and not collect!

Leave all your treasures on the beach...

p p p 3 different shaped shells

p p p 3 different colored shells

p p p 3 kinds of birds in the air

p p p 3 different kinds of birds perched

p p p 3 kinds of sea plants

p p p 3 different colored rocks

p p 2 empty crab shells

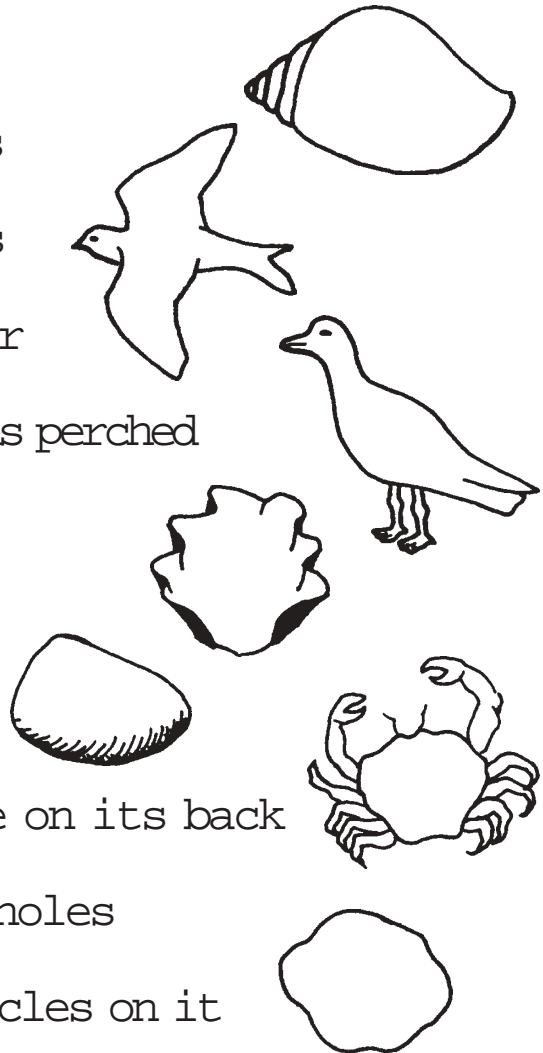
p An animal with its home on its back

p p p 3 different shaped mud holes

p A rock with only 3 barnacles on it

p Something that never changes:

p Something that never remains the same:



Where the River Meets the Sound



Glossary

Adaptation – An adjustment to environmental conditions; a modification of an organism or its parts that helps that plant or animal survive.

Aerate – To supply or add with air.

Algae – Tiny, nonseed-bearing aquatic plants; chlorophyll is often masked by a brown or red pigment.

Anadromous – In reference to fish, species that spend part of their life in freshwater and part in saltwater.

Avian – Of, relating to, or derived from birds.

Aquatic – Growing in, living in, or frequenting water.

Biodegradable – Capable of being broken down to simple compounds, especially into harmless products, by the action of microorganisms.

Biodiversity – The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.

Bird Banding – Attachment of identification tags to individual birds to help scientists understand bird population dynamics and migration routes.

Brackish – Somewhat salty but less salty than sea water.

Carnivore – A flesh eating animal.

Community – A group of plant and animal populations living in a prescribed area or physical habitat.

Consumer – An organism that eats other living things. By eating flesh by catching other organisms, particles of organic matter such as plants or a combination of the two.

Decomposer – An organism (such as bacteria or fungi) that returns components of organic matter to ecological cycles by feeding on and breaking down dead plants and animals.

Delineate – To draw boundaries (i.e., to delineate wetlands).

Dependence – The state of requiring something else for individual survival.

Detritus – Decaying bits of plant and/or animal remains (resembles gooey mud sometimes).

Diurnal – Active or occurring in the daytime.

Ecology – The study of the interrelationship of organisms and their environments.

Ecosystem – A system made up of a community of living things and the physical and chemical environment with which they interact.

Emergent Vegetation – Aquatic vegetation rooted underwater but growing above the surface of the water.

Endangered Species - A species that is in danger of extinction throughout all or a significant portion of its range.

Endangered Species Act - A 1973 Federal law designed to prevent species from passing into extinction.

Endemic - Describing a population or species that is restricted geographically.

Estuary - A body of water or water passage where tidal salt water is diluted by fresh water.

Extinct Species - An animal or plant species that has died out everywhere in the world.

Fledging - To rear until ready for flight or independent activity.

Flyway - A route taken by migratory birds during their flights between breeding grounds in the north and wintering grounds in the south.

Food Chain - A sequence of living organisms in an ecological community in which members of one level feed on those in the level below it and in turn are eaten by those in the level above them.

Food Pyramid - Demonstrates the loss of energy between different levels of consumers of a food chain.

Food Web - The totality of interacting food chains in an ecological community.

Freshwater Habitat - An area where standing freshwater exists year-round in most conditions.

Habitat - The place or type of site where a plant or animal naturally or normally lives, often characterized by a dominant plant form or physical characteristic (the stream habitat, the forest habitat).

Herbivore - An organism that eats living plants or their parts.

Hydrology - The study of water and its properties.

Impoundment - A basin created by the construction of dikes. Water control structures are usually installed in the dikes to allow for the impoundments to be drained off or filled with water.

Inference - The use of logic or even guesses to interpret or explain observations.

Interdependence - Within biological communities, species that depend upon each other, often to the extent that if one is lost, the other cannot exist.

Invertebrate - An animal without a backbone or spinal column.

Magnetic Field - The portion of space near a magnetic body.

Mate - Either member of a breeding pair of animals.

Microclimate - The essentially uniform local climate of a small site or habitat.

Migration - The act of moving (usually seasonally) from one locality to another for feeding or breeding purposes.

Molt - To shed hair, feathers, shell, horns, or an outer layer periodically.

MPD - Miles per day.

Mudflat - An estuarine habitat which extends from the high tide line and supports a variety of fauna, such as shrimp, clams, worms, crabs and geoducks. The far reaches of a mudflat are exposed only at extreme low tide and may support eelgrass beds.

Niche - The place and role played by an organism in a living community.

Nocturnal - Active or occurring at night.

Nutrients - Organic materials that have been broken down by bacteria and used as food by living organisms.

Omnivore - An organism that eats both plant and animal material.

Organism – A living thing.

Pacific Flyway – A route in the western United States, extending from Alaska to Mexico, taken by migratory birds during their flights between breeding grounds in the north and wintering grounds in the south.

Plankton – Microscopic plants and animals floating in bodies of water.

Pollution – Contamination of the environment, especially with human-made wastes.

Predator – An animal (rarely a plant) that captures and eats animals for food.

Prey – An animal killed for food.

Producer – An organism (such as a green plant) which uses solar energy to convert inorganic substances into food (i.e. photosynthesis – it does not have to eat).

Rare Species – A species that has a small number of individuals and /or has a limited distribution. A rare species may or may not be endangered or threatened.

Riparian – On or near the banks of a river or other flowing body of water; usually refers to vegetation.

Riverine – All wetlands and deepwater habitats within two channel banks except wetlands dominated by trees, shrubs, or persistent emergent vegetation.

Salt Marsh – A marsh in an estuary which is influenced by tidal action.

Scat – An animal fecal dropping.

Scavenger – An organism that feeds habitually on refuse or carrion.

Scientific Observation – Descriptions of what we see, hear, feel, taste or smell.

Sediment – The silt, sand and rock material carried by moving water.

Slough – A slow moving backwater connected to a river or estuary.

Species – One population of organisms whose members are able to breed amongst themselves and produce fertile offspring.

Submergent Vegetation – Aquatic vegetation growing underwater.

Threatened Species – A species whose numbers are low or declining. A threatened species is not in immediate danger of extinction, but is likely to become endangered if it is not protected.

Understory – An underlying layer of low vegetation in a forested area.

Upland – Ground elevated above the lowlands, marshlands, or rivers.

Vegetative Community – A group of plant populations living in a prescribed area or physical habitat; it may refer to one or to all of the plant species within a given area.

Watershed – All land and the physical features within the drainage system of a river or series of rivers.

Wetlands – Areas that, at least periodically, have waterlogged soils, support plants adapted to wet soil, and coverage by water. Bogs, freshwater and saltwater marshes, and freshwater and saltwater swamps are examples of wetlands.

Woodland Habitat – Typically, a habitat with trees, shrubs, and a ground layer of vegetation.

Where the River Meets the Sound



Resources

Educator Guides

Aquatic Project Wild. 1987. Western Regional Environmental Education Council. Salina Star Route, Boulder, CO 80302.

Backyard Sanctuary Program. WA Department of Fish & Wildlife. 16018 Mill Creek Blvd, Mill Creek, WA 98012.

Birds, Birds, Birds – Ranger Rick’s Nature Scope. 1988. National Wildlife Federation. 1400 16th St NW, Washington, DC 20036.

Central Valley Habitat Fun Pack. 1989. U.S. Fish & Wildlife Service.

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Endangered Species Habitat Pack. National Institute for Urban Wildlife. 10921 Trotting Ridge Way, Columbia, MD 21044.

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Investigating Aquatic Ecosystems. 1987. Prentice Hall. Scarborough, Ontario.

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Padilla Bay, The Estuary Guide. Padilla Bay Nat’l Estuarine Reserve, 1043 Bayview-Edison Rd, Mt Vernon, WA 98273.

Partners in Paradise: Migratory Birds and Their Habitat. 1994. U.S. Environmental Protection Agency. Philadelphia, PA 19107.

Project Learning Tree. 1988. The American Forest Council. 1250 Connecticut Ave NW, Washington, DC 20036.

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Ridgefield National Wildlife Refuge Educator’s Guide. 1995. Ridgefield National Wildlife Refuge. U.S. Fish & Wildlife Service.

Salt Marsh Manual. 1996. San Francisco Bay National Wildlife Refuge. U.S. Fish & Wildlife Service.

San Francisco Bay Seasonal Wetlands Curriculum. 1990. Santa Clara Audubon Society.

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Where the River Begins: An Educator’s Guide to the Nisqually River of Mount Rainier National Park. Nisqually River Education Project, PO Box 476, Yelm, WA 98597.

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WOW: Wonders of Wetlands. 1991. Environmental Concern, Inc. PO Box P, St. Michaels, MD 21663.

Field Guides

A Guide to Field Identification Birds of North America. 1966. By Charles Robbins et al. Western Publishing Co., NY.

Field Guide to the Birds of North America. 1988. National Geographic Society, Washington, DC.

Mosses, Lichens & Ferns of Northwest North America. 1988. By Vitt, Dale H. et al. Lone Pine Publishing, Edmonton, Alberta.

Orcas, Eagles and Kings, Georgia Strait and Puget Sound. 1992. By Steve Yates. Primavera Press.

Seashore Life of Puget Sound, the Strait of Georgia, and the San Juan Archipelago. 1973. By Eugene Kozloff. University of Washington Press, Seattle.

The Audubon Society Field Guide to North American Birds – Western Region. 1977. By Miklos Udvardy. Alfred Knopf, NY.

The Audubon Society Field Guide to North American Trees – Western Region. 1980. By Elbert Little. Chanticleer Press, NY.

The Natural History of Puget Sound Country. 1991. By Arthur Kruckeberg. University of Washington Press, Seattle.

The Sibley Guide to Birds. 2000. By David Allen Sibley. National Audubon Society, Alfred Knopf, NY.

The Water Link. 1981. By Daniel Chasen. University of Washington Press, Seattle.

Wetlands. Audubon Society Nature Guide. Alfred Knopf, NY.

Additional Resources

At Home with Wetlands. 1990. Publ. 90-31. WA Department of Ecology, Olympia.

Discovering Endangered Species: A learning and activity book. 1988. By Nancy Field & Sally Machlis. Dog Eared Publications.

Nisqually Watershed: Glacier to Delta. 1995. By David Gordon. The Mountaineers/Nisqually River Interpretive Center Foundation, Seattle.

Washington's Wetlands. 1988. Publ. 88-24. WA Department of Ecology, Olympia.

Zoobooks. Endangered Animals (and a variety of other topics) created by Quality Productions, Wildlife Education Ltd.

Useful Websites

Endangered Species Listings
endangered.fws.gov/wildlife.html

National Geographic Rivers
www.nationalgeographic.com/geographyaction/ga17.html

National Wildlife Federation – Activities
www.nwf.org/schoolyardhabitats/natureactivities.cfm

Pacific Salmon Endangered Species
www.nwr.noaa.gov/lsalmon/salmesa

River Library
www.rivernetwork.org/library/resource/index.cfm

WA Department of Ecology
www.ecy.wa.gov

WA Department of Fish & Wildlife
www.wa.gov/wdfw

WA Department of Natural Resources
www.wa.gov/dnr

Essential Academic Learning Requirements and Components (EALRS)

Subject		Number	EALR Description	Corresponding Refuge Curriculum Activities	
Reading		1	The student understands and uses different skills and strategies to read.		
		1.1	use word recognition and word meaning skills to read and comprehend text		Mini-Expedition, Wetland Metaphors
		1.2	build vocabulary through reading		Mini-Expedition, Wetland Metaphors
		1.3	read fluently, adjusting reading for purpose and material		Mini-Expedition
		2	The student understands the meaning of what is read.		
		2.1	comprehend important ideas and details		Mini-Expedition
		2.2	expand comprehension by analyzing, interpreting, and synthesizing information and ideas		Mini-Expedition
		3	The student reads different materials for a variety of purposes.		
		3.1	read to learn new information		Holding a Town Meeting
		3.2	read to perform a task		Habitat Comparison Walk, Mini-Expedition, Scavenger Hike
Writing		1	The student writes clearly and effectively.		
		1.1	develop concept and design		My Own Personal Refuge, Wild Words
		1.2	use style appropriate to the audience and purpose		My Own Personal Refuge, Wild Words
		1.3	apply writing conventions		Wild Words
		2	The student writes in a variety of forms for different audiences and purposes.		
		2.1	write for different audiences		Wild Words
		2.2	write for different purposes		Wild Words
		2.3	write in a variety of forms		Wild Words
		3	The student understands and uses the steps of the writing process.		
		3.1	prewrite		Wild Words
		3.2	draft		Wild Words
Communication		1	The student uses listening and observation skills to gain understanding.		
		1.1	focus attention		Preparing Students for the Field Trip, Sensing Nature, Mini-Expedition, Wild Words, Holding a Town Meeting
		1.2	listen and observe to gain and interpret information		Preparing Students for the Field Trip, Sensing Nature, Habitat Comparison Walk, Mini-Expedition, Wild Words, Holding a Town Meeting
		2	The student communicates ideas clearly and effectively.		
		2.1	communicate clearly to a range of audiences for different purposes		Mini-Expedition, Wild Words
		2.2	develop content and ideas		Mini-Expedition, Wild Words, Holding a Town Meeting
		2.3	use effective delivery		Why The Tides Ebb and Flow, Mini-Expedition, Wild Words, Holding a Town Meeting
		2.4	use effective language and style		Wild Words, Holding a Town Meeting
		2.5	effectively use action, sound, and/or images to support presentations		Holding a Town Meeting

Essential Academic Learning Requirements and Components (EALRS)

Subject	Number	EALR Description	Corresponding Refuge Curriculum Activities
Communication			
	3	The student uses communication strategies and skills to work effectively with others.	
	3.1	use language to interact effectively and responsibly with others	Preparing Students for the Field Trip, Mini-Expedition, Holding a Town Meeting, Watershed Watchers, Wetland Metaphors, Habitats and Food Chains, All Things Seaward, Marsh to Metropolis, Plants and People
	3.2	work cooperatively as a member of a group	Preparing Students for the Field Trip, Why The Tides Ebb and Flow, The Web of Life, Mini-Expedition, Watershed Watchers, Wetland Metaphors, Habitats and Food Chains, All Things Seaward, Marsh to Metropolis, Plants and People
	3.3	seek agreement and solutions through discussion	Preparing Students for the Field Trip, Mini-Expedition, Holding a Town Meeting, Watershed Watchers, Wetland Metaphors, All Things Seaward, Marsh to Metropolis, No Trash Lunch, Plants and People
Mathematics			
	4	The student communicates knowledge and understanding in both everyday and mathematical language.	
	4.1	gather information	
	4.2	organize and interpret information	Habitat Comparison Walk, Mini-Expedition
	4.3	represent and share information	Mini-Expedition
Science			
	1	The student understands and uses scientific concepts and principles.	
	1.1	use properties to identify, describe, and categorize substances, materials, and objects, and use characteristics to categorize living things	What Can I Eat With This Beak?, Soft Squishy Hard Spiky, The Web of Life, Habitat Comparison Walk, Mini-Expedition, Scavenger Hike, How to Pack a No Trash Lunch, Habitats and Food Chains, Plants and People
	1.2	recognize the components, structure, and organization of systems and the interconnections within and among them	Food Chain, My Own Personal Refuge, Habitat Comparison Walk, Mini-Expedition, Scavenger Hike, Habitats and Food Chains, The Web of Life Plants and People
	1.3	understand how interactions within and among systems cause changes in matter and energy	Trace Your Trash, Food Chain, What Can I Eat With This Beak?, Bird Mapping, What Am I Hungry For?, Wild Words, Habitats and Food Chains, All Things Seaward

Essential Academic Learning Requirements and Components (EALRS)

Subject	Number	EALR Description	Corresponding Refuge Curriculum Activities
Science	2	The student knows and applies the skills and processes of science and technology.	
	2.1	develop abilities necessary to do scientific inquiry	Sensing Nature, The Web of Life, Habitat Comparison Walk, Mini-Expedition, Scavenger Hike, Wild Words, Wetland Metaphors, Habitats and Food Chains
	2.2	apply science knowledge and skills to solve problems or meet challenges	Bird Mapping, Habitat Comparison Walk, Mini-Expedition, How to Pack a No Trash Lunch
	3	The student understands the nature and contexts of science and technology.	
	3.1	understand the nature of scientific inquiry	Sensing Nature, Mini-Expedition, Scavenger Hike, Habitats and Food Chains
	3.2	know that science and technology are human endeavors, interrelated to each other, to society, and to the workplace	Trace Your Trash, Food Chain, What Can I Eat How to Pack a No Trash Lunch
History	1	The student examines and understands major ideas, eras, themes, developments, turning points, chronology, and cause-and-effect relationships in U.S., world, and Washington State history.	
	1.1	understand historical time, chronology, and causation	Marsh to Metropolis, Plants and People
	1.2	analyze the historical development of events, people, places, and patterns of life in the U.S., world, and Washington State history	Marsh to Metropolis
	1.3	examine the influence of culture on U.S., world, and Washington State history	Marsh to Metropolis, Plants and People
	2	The student applies the methods of social science investigation to investigate, compare and contrast interpretation of historical events.	
	2.1	investigate and research	Holding a Town Meeting (Extension)
	2.2	analyze historical information	Holding a Town Meeting (Extension), Marsh to Metropolis
	2.3	synthesize information and reflect on findings	Holding a Town Meeting (Extension) Marsh to Metropolis
	3	The student understands the origin and impact of ideas and technological developments on history and social change.	
	3.3	understand how ideas and technological developments influence people, resources, and culture	Holding a Town Meeting, Marsh to Metropolis, Plants and People
Geography	1	The student uses maps, charts, and other geographic tools to understand the spatial arrangement of people, places, resources, and environments on Earth.	
	1.1	use and construct maps, charts, and other resources	Preparing Students for the Field Trip, Bird Mapping, All Things Seaward
	1.2	recognize spatial patterns on Earth's surface and understand the processes that create these patterns	All Things Seaward

Essential Academic Learning Requirements and Components (EALRS)

Subject	Number	EALR Description	Corresponding Refuge Curriculum Activities
Geography	2	The student understands the complex physical and human characteristics of places and regions.	
	2.1	describe the natural characteristics of places and regions	Habitat Comparison Walk, Mini-Expedition
	2.2	describe the patterns humans make on places and regions	Trace Your Trash, Habitat Comparison Walk
	2.3	identify the characteristics that define the Pacific Northwest and the Pacific Rim as regions	Habitat Comparison Walk, Scavenger Hike, Marsh to Metropolis
	3	The student observes and analyzes the interaction between people, the environment, and culture.	
	3.1	identify and examine people's interaction with and impact on the environment	Preparing Students for the Field Trip, Sensing Nature, Trace Your Trash, Bird Mapping, My Own Personal Refuge, Habitat Comparison Walk, Holding a Town Meeting, Watershed Watchers, Wetland Metaphors, All Things Seaward, Marsh to Metropolis, How to Pack a No Trash Lunch, Plants and People
	3.2	analyze how the environment and environmental changes affect people	Trace Your Trash, My Own Personal Refuge, Habitat Comparison Walk, Holding a Town Meeting, Watershed Watchers, Wetland Metaphors, How to Pack a No Trash Lunch, All Things Seaward, Marsh to Metropolis, Plants and People
Civics	3.3	examine cultural characteristics, transmission, diffusion, and interaction	Sensing Nature, Trace Your Trash, Marsh to Metropolis, Plants and People, Holding a Town Meeting, All Things Seaward
	1	The student understands and can explain the core values and principles of the U.S. democracy as set forth in foundational documents.	
	1.3	examine representative government and citizen participation	Holding a Town Meeting
	2	The student analyzes the purposes and organization of governments and laws.	
	2.1	understand and explain the organization of U.S. government	Holding a Town Meeting
	2.2	understand the function and effect of law	Holding a Town Meeting
	4	The student understands the rights and responsibilities of citizenship and the principles of democratic civic involvement.	
Economics	4.1	understand the individual rights and their accompanying responsibilities	Holding a Town Meeting, Watershed Watchers
	4.2	identify and demonstrate rights of U.S. citizenship	Holding a Town Meeting
	4.3	explain how citizen participation influences public policy	Holding a Town Meeting
	1	The student understands basic economic concepts and analyzes the effect of economic systems on individuals, groups, and society.	
	1.2	observe major forms of business and related careers	Holding a Town Meeting
	1.4	examine how government policies influence the economy	Holding a Town Meeting

Essential Academic Learning Requirements and Components (EALRS)

Subject	Number	EALR Description	Corresponding Refuge Curriculum Activities
Arts			
	1	The student acquires the knowledge and skills necessary to create, to perform, and to respond effectively to the arts.	
	1.1	understand and apply arts concepts and vocabulary to communicate ideas	Habitat Comparison Walk, Wild Words, Habitats and Food Chains
	1.2	organize arts elements into artistic compositions	Habitat Comparison Walk, Wild Words, Habitats and Food Chains
	1.3	use and develop arts skills and techniques to solve problems and express ideas	Habitat Comparison Walk, Wild Words, Habitats and Food Chains
	2	The student applies the creative process with arts knowledge and skills to reason and solve problems.	
	2.1	use the senses to gather and process information	Scavenger Hike, Wild Words, Habitats and Food Chains, Plants and People
	2.2	generate and analyze solutions to problems using creativity and imagination	Habitats and Food Chains, Plants and People
	3	The student uses at least one of the art forms (visual arts, music, drama, and/or dance) to communicate ideas and feelings.	
	3.1	use image, sound, action, and movement through the arts to express individual ideas for a specific purpose	Wild Words
	4	The student understands how the arts connect to other subject areas.	
	4.1	use arts skills and knowledge in other subject areas	Soft Squishy Hard Spiky, Habitat Comparison Walk, Wild Words, Habitats and Food Chains, Plants and People
Health and Fitness			
	1	The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition.	
	1.1	develop fundamental physical skills and progress to complex movement activities as physically able	Sensing Nature, Habitat Comparison Walk
	1.2	incorporate rules and safety procedures into physical activities	Sensing Nature, Habitat Comparison Walk